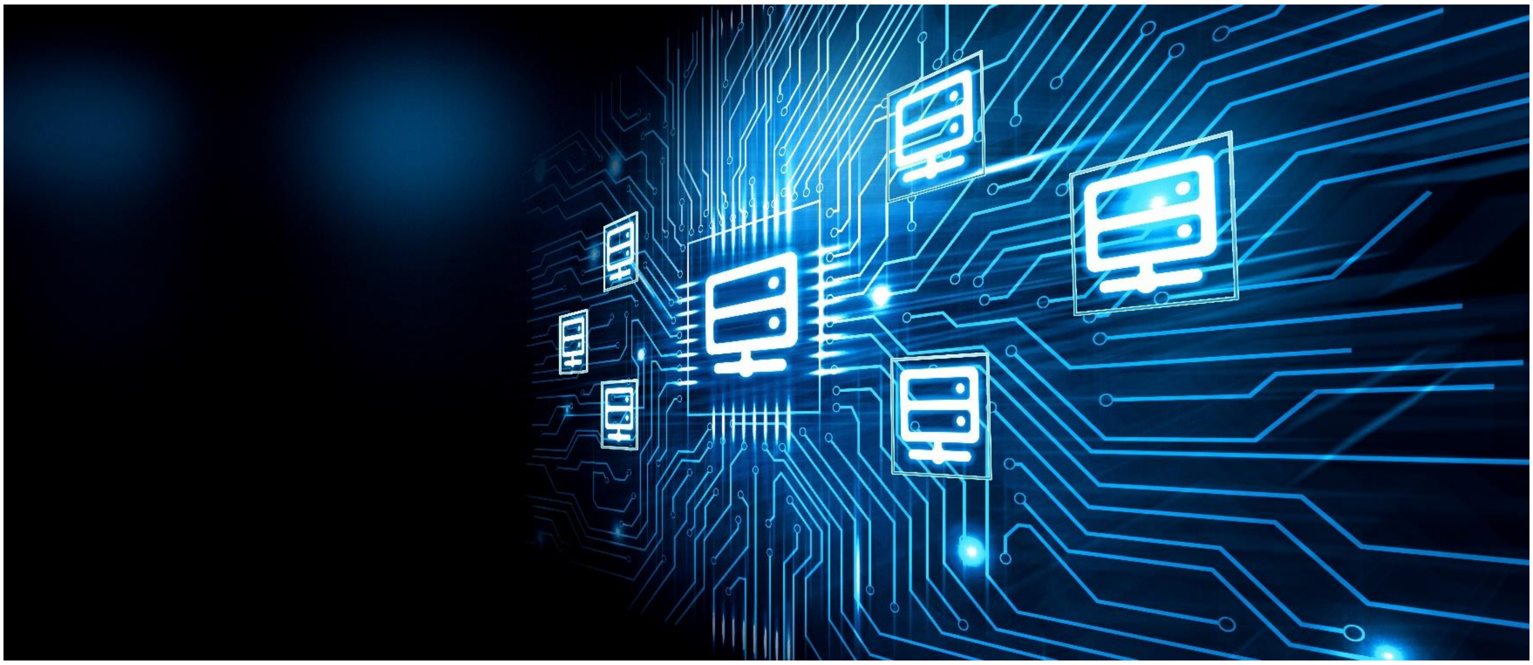
Integration Composer

Version 7.6.1.X for IBM Control Desk



Administrator Guide

Note

Before using this information and the product it supports, read the information in “Notices” on page 187.

This edition applies to version 7, release 6, modification 1 of IBM Integration Composer and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About this publication

This guide explains how to use IBM® Integration Composer (Integration Composer) to import information technology (IT) data from an external data source into the target IBM Control Desk database.

The guide explains how to access and navigate Integration Composer, define new data sources, view existing data sources, create, and execute mappings to import data, and create and edit new data schemas.

Intended audience

Information technology asset managers, system administrators, and other personnel responsible for importing data from external sources into a target IBM Control Desk database should read this guide.

Introduction to Integration Composer

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This chapter introduces you to IBM® Integration Composer, an integration tool that lets you transform and import information technology (IT) data from a source into a target IBM Control Desk database.

The chapter provides the following introductory information about Integration Composer:

- Overview of how Integration Composer integrates with the IBM Control Desk database
- Product versions compatible with Integration Composer
- Main architectural components
- Information about Integration Composer adapters
- Integration Composer file structure
- Error management and performance monitoring
- Description of the process used to set up mappings and import data into a target IBM Control Desk database
- Overview of data schemas, including information about classes, properties, instances, class hierarchies, key properties, and relationships

Integration Composer Overview

Integration Composer is an integration tool that imports hardware and software inventory data from external data sources into the IBM Control Desk database tables for deployed assets and configuration items. With Integration Composer, an enterprise can aggregate data collected by discovery tools and integrate it, creating a central repository for enterprise IT asset management, reporting, and decision support.

Integration Composer supports integration with various discovery and system management tools. To gather data about deployed assets, the discovery tools scan computers, network devices, and network printers deployed in an enterprise and store information about the hardware and software installed on those assets in an IBM Control Desk database. Integration Composer transforms the data and imports it into the IBM Control Desk database.

Before you import data from an external data source into the target database, you use Integration Composer to create a mapping to transform data from the source format to the target format. A mapping is a set of expressions that tell Integration Composer how to create data in the target using information from a source. For each property that you want to import, you define an expression that specifies how to transform the data for that property when Integration Composer imports the data from the source into the target. When you execute a mapping, Integration Composer transforms the collected data and imports it into the target.

If you have installed IBM Control Desk, you can view and manage imported hardware and software data in the Deployed Assets applications: Computers, Network Printers, Network Devices, and Deployed Software. You can also view and manage imported hardware and software data in the IT Infrastructure applications: Configuration Items and Actual Configuration Items.

When you first implement IT asset management, you can also use Integration Composer's asset initialization adapter to create a baseline set of authorized IT asset records from the deployed asset data that you imported. Authorized IT asset data is managed in the Assets application.

Integration Composer connects to data sources using either Java™ Database Connectivity (JDBC™) technology-enabled drivers or an application programming interface (API).

System Requirements

The hardware and software requirements for Integration Composer vary according to operating system, IBM Control Desk database platform, and site configuration. For information about installation prerequisites, see the Integration Composer Installation Prerequisites.

Product Versions Supported

Integration Composer works with the following products:

- IBM Control Desk

Integration Composer Components

Integration Composer consists of the following components:

- Integration Composer application
- Integration Composer engine
- JDBC drivers or the Application Programming Interfaces (API)
- Integration Composer repository

User Interface

the Integration Composer user interface lets you define data sources, browse source data, define data schemas, and create mappings to transform and import data. The user interface lets you perform the following tasks:

- Designate a data source and establish a connection to that data source.
- Create new mappings that define how to change data and transfer it from a source data source to the target database.
- Customize existing mappings to meet integration requirements.
- Create and edit data schemas for use with Integration Composer.

Engine

The Integration Composer engine processes mapping expressions that transform data from a source data source and integrate it into a target data source.

Connection Methods

Integration Composer uses JDBC drivers or an API to establish connections to the source data and target database. Integration Composer includes the following connection methods:

- Oracle® JDBC Thin Driver
- JDBC Driver for Microsoft® SQL Server
- IBM DB2® JDBC Driver
- Generic JDBC Driver
- IBM Configuration Discovery and Tracking API

Integration Composer Repository

The Integration Composer repository resides in the IBM Control Desk database and contains the following Integration Composer data:

- Metadata for data schemas. This metadata defines the structure of the data.

  Integration Composer provides the following data schemas:

  - data schemas for commonly used discovery tools
  - data schemas for the most frequently used target, the Deployed Assets tables in the IBM Control Desk database.

  - data schemas to use for the IT asset initialization process, which lets you create a baseline set of IT assets when you first implement IT asset management.

- Data source definitions that provide IBM Control Desk database connection parameters and bidirectional language settings.
- Mappings that define how to transform data and migrate it from a source to a target.
- The time stamp of the most recent scan for top-level objects in the source data, if such a last-scan time stamp exists.

Import Process

Integration Composer has a Java-based user interface application and an engine. The user interface is used to create and manage object models as well as rules for data transformation. The engine transforms source IBM Control Desk database instances and transfers them to the target according to a set of defined rules.

Classes from the source database are mapped to target class properties using the mapping rules. Properties from more than one source class can be mapped to a single target class or single target property. The mapping rules can be as simple as a one-to-one mapping or can involve a Java expression.

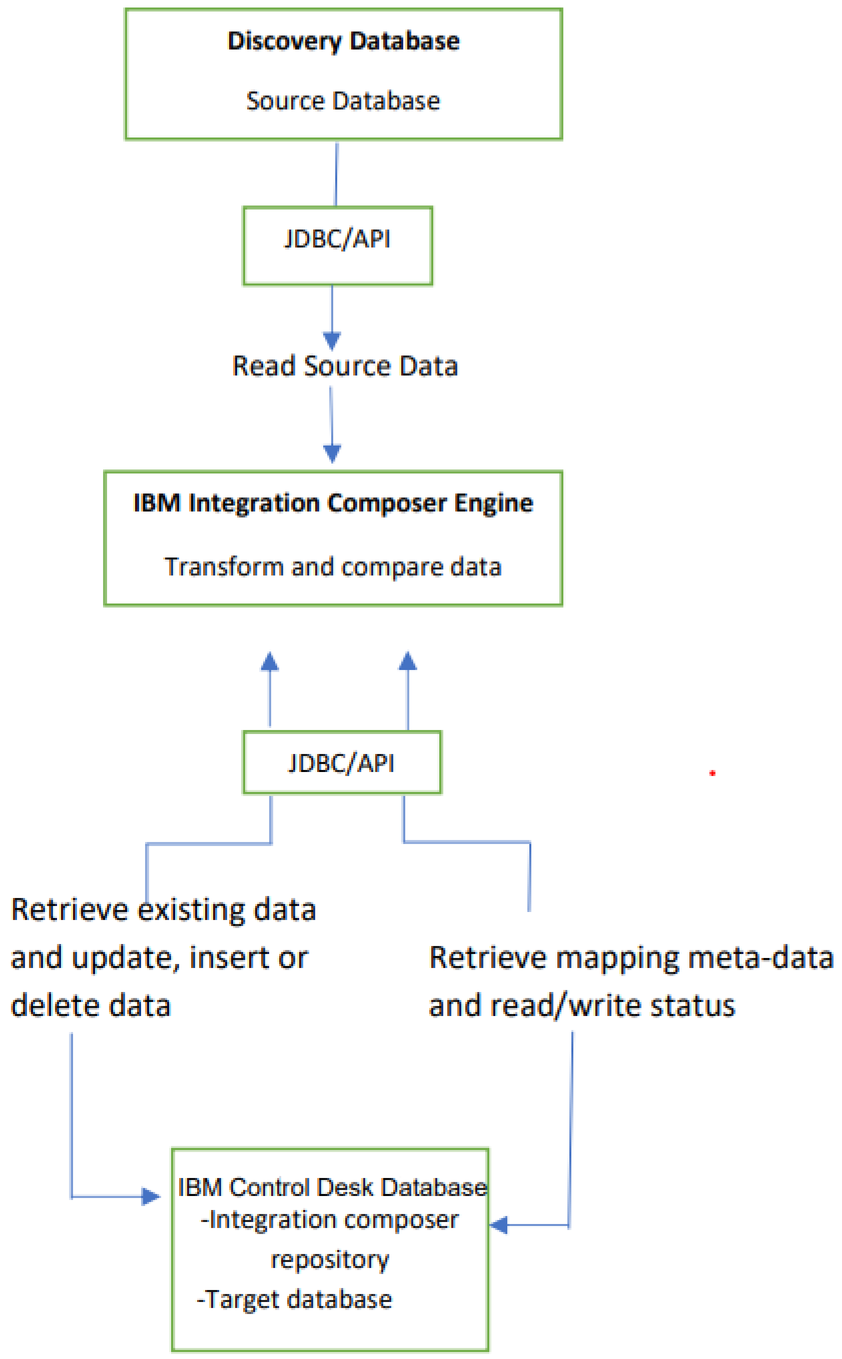
When Integration Composer executes a mapping, it reads source database instances, applies the rule set, compares the transformed data against the associated target instances (if any exist), and updates the target database in the following ways:

- If, during the data transfer process, the engine finds a new instance, it inserts that instance into the target.
- If the engine encounters an existing target instance, it evaluates the instance to determine if newer data exists. If new data exists, the engine updates the target instance. Otherwise, the instance is skipped.
- If data exists in the target but does not exist in the source, the instance might be deleted from the target. Deletion depends on qualifiers. For example, in the Deployed Assets data schema, instances of deployed asset classes are not deleted, but instances of software classes can be deleted.

Most discovery agents store a data collection time stamp. For increased performance during mapping execution, Integration Composer compares the source time stamp for a top-level instance against an internally stored time stamp, a last scan time stamp. If time stamps differ, the top-level instance along with its child and reference class instances are processed, and the internally stored time stamp is updated. Otherwise, these instances are skipped.

The following diagram illustrates the data is processed.

Integration Composer Process Flow


Discovery Database
Source Database
JDBC/API
Read Source Data
IBM Integration Composer Engine
Transform and compare data
JDBC/API
Retrieve existing data and update, insert or delete data
Retrieve mapping meta-data and read/write status
IBM Control Desk Database
-Integration composer repository
-Target database

Integration Composer Adapters

An adapter consists of a data schema and a mapping. To import data from a source database into a target database, you create a mapping that specifies how to transform data from the source format to the target format. A mapping is a set of expressions that tell Integration Composer how to create data in the target using information from a source. For each property in the target that you want to import data into, you define an expression that specifies how to transform the data for that property. To import the data, you execute the mapping.

To facilitate data migration, Integration Composer provides adapters to transform and import data maintained by commonly used asset- and system-management tools. Each adapter is designed for a specific discovery tool.

Adapters include a file with an .fsn extension that contains predefined mapping expressions for transforming data from the format of the source data to the format of the target database. You import an adapter mapping into Integration Composer, modify it to suit your business needs, and execute the mapping to import data into a target database.

To integrate data from other discovery tools, you can use the Create Data Schema feature in Integration Composer to create a data schema for the discovery tool. After creating the data schema, you can create a mapping based on the new data schema and use the mapping to import data into the target database.

File Structure

When you install Integration Composer, if you accept the default installation path, the installer creates an Integration Composer installation directory and installs Integration Composer using the following file structure.

Integration Composer File Structure

```
Integration Composer
    bin
    data
        dataschema
        mappings
        properties
            nrs
            provider
    etc
    genrules
    help
    lib
    log
    Uninstall_Integration_Composer
```

If you select a different location when you install Integration Composer, the installer creates the same file structure in the location that you specify.

The Integration Composer folders store the following data:

Folder	Description
bin	Stores the following files: ▼ encryptExecuteMappingProperties.bat (Microsoft Windows®) or encryptExecuteMappingProperties.sh (UNIX®) – file that encrypts the properties in the executeMapping.properties file. ▼ executeMapping.bat (Microsoft Windows®) or executeMapping.sh (UNIX®) – file that executes an Integration Composer mapping. ▼ init.bat (Microsoft Windows) or init.sh (UNIX) – file used to define and initialize the Integration Composer environment. ▼ startFusion.bat (Microsoft Windows) or startFusion.sh (UNIX) – file that launches Integration Composer. ▼ executeMapping.properties – file that contains the properties for executing a mapping, including properties for the repository password, source data source password, and target data source password.

Folder	Description
data	Stores the following folders: **data schema –** stores data schemas that users export from Integration Composer or that users copy to this folder from other sources. **mappings –** stores mappings that come with Integration Composer and is the default directory for importing and exporting mappings from the Integration Composer user interface. **properties –** contains specialized application properties files. ■ **nrs –** contains a specialized property file for Naming and Reconciliation Service logging properties. ■ **provider –** contains a specialized property file for IT asset initialization.
etc	Stores files used by the IBM Tivoli Application Dependency Discovery Manager Software Development Kit. Do not modify any files in this folder.
genrules	Stores Java source files that Integration Composer creates when you execute a mapping. Do not modify any files in this folder.
help	Stores the Integration Composer help files. Do not modify any files in this folder.
lib	Stores application program interfaces (APIs) that Integration Composer uses, including JDBC drivers. Do not modify any files in this folder.
log	Stores Integration Composer log files.
Uninstall_Integration_Composer	Stores the files that uninstall Integration Composer from a computer. Do not modify any files in this folder.

Mapping Process

If you are using an Integration Composer adapter to migrate data, see the documentation for that adapter for information about using the adapter to import data. Some adapters require that you perform additional preliminary steps before you can import data.

The following summary outlines the sequence of operations to perform when you import data into the target database. Detailed instructions for each of these steps is provided in the following chapters of this guide.

1 Define the source and target data sources.

Before you can view data, sources or create a mapping, you must define a data source for any *source* that contains the data you want to import and for the *target* IBM Control Desk database. Integration Composer uses JDBC drivers or an API to connect to source and target data sources. After you install Integration Composer, you must define source and target data sources. To define a data source, select **Define New Data Source** in the Integration Composer user interface and perform following steps:

- Select a data schema for the data source.
- Name the data source.
- Select a connection method and specify the parameters for connecting to the data source.
- Optional: If you have installed Integration Composer in Hebrew or Arabic, specify bidirectional layout formats for the data source to which you are connecting.

2 Review the data in the data sources.

To review classes in a data schema, select **Browse Data Source by Structure** in the Integration Composer user interface. Select **Browse Data Source by Data** to review data source instances in addition to classes.

3 Create a new mapping.

To create a new mapping, you select **Create New Mapping** in the IBM Integration Composer window. Integration Composer displays a New Mapping window in which you select a source data source, select a target data source, and name the mapping.

4 Add expressions to the mapping.

After you create a mapping and name it, Integration Composer displays the Mapping window. In this window, you can import the predefined mapping expressions provided in an Integration Composer adapter; or you can create mapping expressions.

5 Execute the mapping.

After you create and save a mapping, you execute a mapping from a command line. When you execute a mapping, Integration Composer transforms the data and imports it into the target database. To update data in the target database, such as importing data about new computer equipment, you can run an existing mapping as often as needed.

Error Management and Performance Monitoring

When Integration Composer executes mappings, it provides information about mapping executions and data transactions as well as errors in log files. You can view log files in the following location:

<InstallDir>\log

By default, the **mxe.fusion.mapping.showRecordCounts** property in the fusion.properties file is set to true, and the fusion.log file displays record counts for records created, updated, and deleted.

The log file also displays information about events related to the Naming and Reconciliation Service (NRS) process, including information about actions taken when duplicate deployed assets are found and NRS record counts.

Example

```
Mapping execution completed
      Mapping: cent2007 Execution
      time: 00:02:45
      Deployed Assets created: 211
       Records   created:      8356
       Records   updated:      0
       Records   deleted:      0
        Errors:     0

      NRS GUIDs created: 210
      NRS records updated on Alternate Keys: 0 NRS records
      found as duplicate: 0
      NRS records deleted because of duplicate: 0
```

For information about setting up logs to provide information about mapping executions and data transactions, see “Logging Properties File (logging.properties)” on page 135.

Naming and Reconciliation Service Logs

There is an NRS-specific log file, dis%u.consolidate, that provides information about the NRS process. Both log and trace information are recorded in this log file. The log file is saved in the following location:

```
<InstallDir>\log\dis%u.consolidate
```

When the log file is written, the **%u** characters are replaced with a number that identifies the log file.

For more information about the NRS log file, see Appendix D, "Naming and Reconciliation Service (NRS)," on page 144.

Viewing Mapping Information in the IBM Control Desk Database

You can view information about mapping executions in the TLOAMFSNRUNSTATUS table in the Integration Composer repository in the IBM Control Desk database. This table maintains the following information about mapping runs:

- Mapping name
- Source and target schema
- Source and target data source
- Start and end time for the mapping
- Number of records inserted, updated, deleted
- Whether the mapping failed or not
- Number of errors

This information is updated when mapping execution is completed. There is one record per mapping name.

You cannot view this information in the user interface. You must use a query tool to view information in the IBM Control Desk database.

Database Errors

This section describes errors that cause Integration Composer to stop processing data.

DB2 Database Errors

When processing data from a DB2 database, Integration Composer will stop processing and display an error message if one of the following events occurs:

- The package corresponding to an SQL statement execution request is not found (binding). For example,

  "SQLCODE: -805, SQLSTATE: 51002, SQLERRMC: NULLID.SYSLH204"

- Virtual storage or adequate database resource is not available (table space). For example,

  "SQLCODE: -289, SQLSTATE: 57011, SQLERRMC: MAXDATA"

When these errors are encountered, mapping execution stops, and the following message is displayed:

Error Message:	Stop on FATAL error

This problem must be resolved by a system or database administrator.

Oracle Database Errors

When processing data from an Oracle database, Integration Composer will stop processing if any of the errors in the following table occur. Error 01632 applies to indexes, and errors 01651 through 01667 apply to table space errors.

Message Number	Message Description
ORA-01632	Maximum number of extents (name) was reached in index name
ORA-01651	Unable to extend save undo segment by string for table space string
ORA-01652	Unable to extend temp segment by string in table space string
ORA-01653	Unable to extend table string.string by string in table space string
ORA-01654	Unable to extend index string.string by string in table space string
ORA-01655	Unable to extend cluster string.string by string in table space string
ORA-01656	Maximum number of extents (string) reached in cluster string.string
ORA-01657	Invalid SHRINK option value
ORA-01658	Unable to create INITIAL extent for segment in table space string
ORA-01659	Unable to allocate MINEXTENTS beyond string in table space string
ORA-01660	Table space string is already permanent
ORA-01661	Table space string is already temporary
ORA-01662	Table space string is not empty and cannot be made temporary
ORA-01663	The contents of table space string are constantly changing
ORA-01664	Transaction which has expanded the Sort Segment has aborted
ORA-01665	Control file is not a standby control file
ORA-01666	Control file is for a standby database
ORA-01667	Cannot add any more table spaces: limit of string exceeded

Monitoring Performance

You can use the PerfMon performance monitoring tool to analyze performance and isolate problems in processing. To activate this tool, uncomment the **perfmon.output** property in the fusion. properties file and specify a valid directory for the performance log, as shown in the following example:

```
perfmon.output=“c:\\<InstallDir>\\perfmon.log”
```

After you activate this property, a log file is created when you run a mapping. This log file provides information about the total mapping time and the amount of time that was required to perform the following operations:

- call NRS
- retrieve Integration Composer metadata from the repository
- run the mapping expressions (by class)
- retrieve data from the target to differentiate
- differentiate source and target data
- update/insert/delete in the target database
- retrieve source data

Introduction to Data Schemas

A data schema is a structure for organizing and classifying data in an IBM Control Desk database. It defines both the data contents and relationships. Integration Composer transforms the data in the source to the formats required by the data schema of the target database.

A data source is the actual data in a database organized in the structure defined by a data schema.

Classes, Properties, and Instances

Class

In Integration Composer, data schemas organize data into classes. A **class** is a group of data that has the same characteristics or properties. For example, you can define a class called 'Computer' because computers share many characteristics or properties.

Property

A **property** is an attribute or feature that characterizes a class. The collection of properties assigned to a class defines the class. A class can have multiple properties. For example, objects classified as computers have the following properties: 'Hardware ID,' 'Manufacturer,' 'Model,' and 'Serial Number.'

The data schema defines the structure in which properties are stored and organizes the properties into classes. A data schema defines the formats for property data. A format might include a property name, type, and length. For example, the property 'Manufacturer' might be named *Manufacturer ID*. Its type is *integer*. Its length is *10*.

In Integration Composer all properties have a name, type, and length.

- The ***name*** uniquely identifies the property in a class.
- The ***type*** of property indicates the format of the data. Integration Composer uses JDBC type names.
- The ***length*** of a property is determined by the limit defined for the database column that corresponds to that property. You can manually change the length, but the length cannot exceed the limit set for the corresponding database column.

Some properties have specialized functions and unique characteristics that you must consider when creating mappings in Integration Composer. Key properties and reference properties have specialized functions. For more information about keys and reference relationships, see “Key Properties and Relations” on page 16.

Instance

Whereas a class is a group of objects that share the same properties, an **instance** is a specific object that belongs to a class. If the class 'Computer' is characterized by the properties 'Hardware ID,' 'Manufacturer,' 'Model,' and 'Serial Number,' then a specific instance of the class, the computer *HQLz2310*, is characterized by the properties *0399483* ('Hardware ID'), *Dell*® ('Manufacturer'), *Pentium*® *4* ('Model'), and *938348393* ('Serial Number').

The instances of a class contain data about an object. Databases store this data in the structures defined for the properties of the class. All instances of the same class have the same set of properties, but each instance has different values for those properties.

Class Hierarchy

An Integration Composer data schema logically organizes classes into a hierarchy or tree. A bonding link between classes is called a relationship. Classes have two categories of relationships:

- Parent-child
- Reference

Parent-Child Relationship

Most relationships in a tree are parent-child relationships. A parent-child relationship is a very strong relationship between two classes. Think of it as a “has a” or “containment” relationship.

In a parent-child relationship:

- Every child class has a parent class. Every instance of a child class has an instance of a parent class.
- A parent can be a child in another relationship.
- A parent class instance can exist without a child class instance.
- Every child class has only one parent class, but a parent class can have more than one child class.
- In terms of databases, a parent class has a one-to-many relationship with a child class.

Reference Relationship

A reference relationship is weaker than a parent-child relationship. Think of it as a “refers to” relationship.

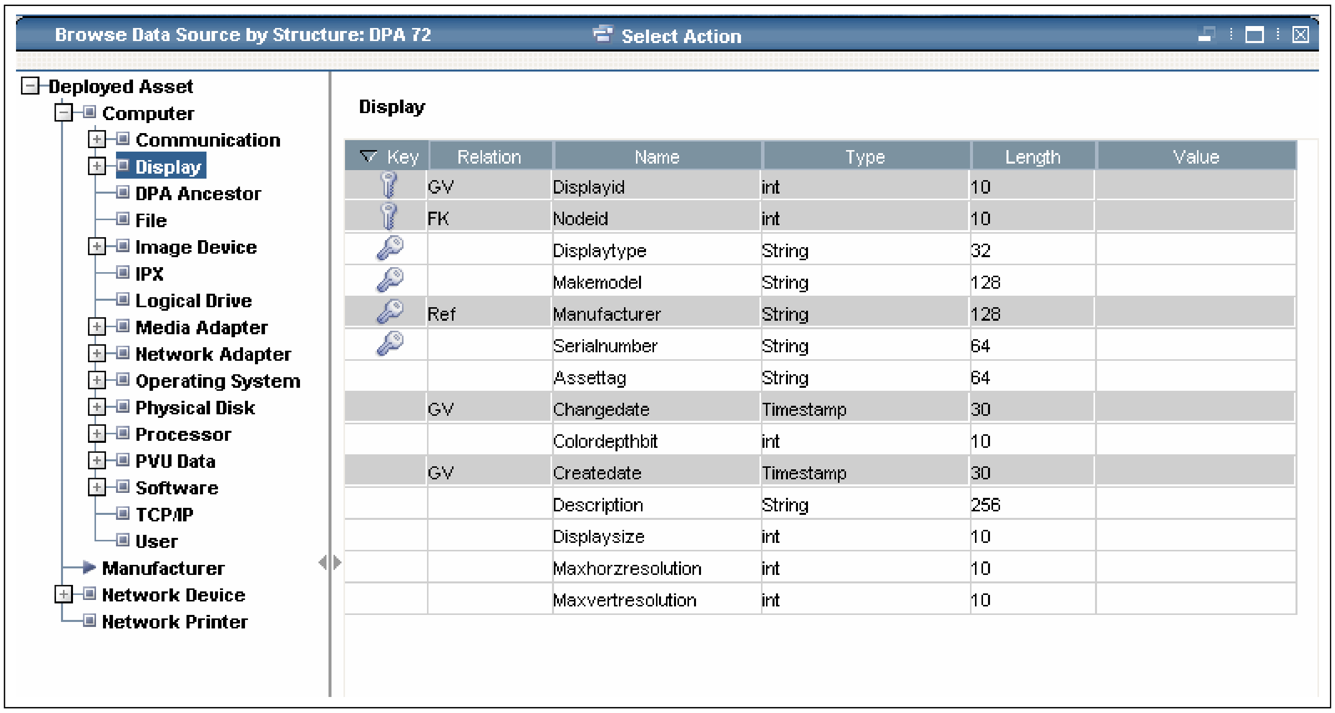
In a reference relationship:

- A reference relationship exists between two classes when one class has complementary information about another class.
- A class in a reference relationship can exist without the other class.
- In terms of databases, a parent class has a many-to-one relationship to a reference class.
- A class can appear only once in a parent-child relationship but many times in a reference relationship.

Tree View

the Integration Composer user interface displays class relationships in a tree, as illustrated in the following figure. The tree displays classes in a hierarchical structure. At the top of the tree is the root class. A root class is a parent class. Below the root (parent) class are child classes or reference classes. If a child class has other classes below it, the child class becomes the parent class to those child or reference classes.

Integration Composer Classes and Properties Example


Browse Data Source by Structure: DPA 72

- Deployed Asset
  - Computer
    - Communication
    - Display
    - DPA Ancestor
    - File
    - Image Device
    - IPX
    - Logical Drive
    - Media Adapter
    - Network Adapter
    - Operating System
    - Physical Disk
    - Processor
    - PVU Data
    - Software
    - TCP/IP
    - User
  - Manufacturer
  - Network Device
  - Network Printer

Display

Key	Relation	Name	Type	Length	Value
	GV	Displayid	int	10	
	FK	Nodeid	int	10	
		Displaytype	String	32	
		Makemodel	String	128	
	Ref	Manufacturer	String	128	
		Serialnumber	String	64	
		Assettag	String	64	
	GV	Changedate	Timestamp	30	
		Colordepthbit	int	10	
	GV	Createdate	Timestamp	30	
		Description	String	256	
		Displaysize	int	10	
		Maxhorzresolution	int	10	
		Maxvertresolution	int	10	

NOTE A child class is represented by the ▣ (square) symbol.
A reference class is represented by the ▶ (arrow) symbol.

The preceding figure shows the following class relationships:

- **Deployed Asset** is a *Root* class.
- **Deployed Asset** is a *Parent* class to **Computer**.
- **Computer** in turn is a *Child* class to **Deployed Asset**, but **Computer** is also a *Parent* class to **Display**.
- **Display** is a *Child* class to **Computer**.

In the preceding figure, **Manufacturer** is a *Reference* class to Deployed Asset.

Key Properties and Relations

Some properties in a class have specialized functions and unique characteristics to consider when creating mappings in Integration Composer. For example, key properties and reference properties have specialized functions.

Primary Key

A primary key is a property or set of properties that uniquely identifies each instance of its class. Every Integration Composer class must have at least one property defined as a primary key; this property (or properties) uniquely identifies each instance of the class.

In a parent-child relationship, the child class must contain at least one primary key that is also a primary key of the parent class. In the “Integration Composer Classes and Properties Example” on page 15, **Display** is a child of **Computer**; the class **Display** has two primary keys:

- **Displayid**
- **Nodeid** (which is a primary key of the parent Computer)

The combination of **Displayid** and **Nodeid** uniquely identifies each instance of the class **Display.**

Foreign Key (FK)

A foreign key (FK) is a property or set of properties in a child class that Integration Composer derives from one or more primary key properties in the parent class. When Integration Composer executes a mapping, it copies the value for the foreign key from the primary key of the parent class to the child class.

In the “Integration Composer Classes and Properties Example” on page 15, the property **Nodeid** in the child class **Display** is a foreign key to the parent class **Computer**. When Integration Composer executes a mapping, it copies the value for the property **Nodeid** in the parent class **Computer** to the child **Display**.

Alternate Key

An alternate key is a property or set of properties that is an *equivalent* way to identify an instance. The combination of the alternate key values must be unique *within the class*. If a primary key is a generated value, Integration Composer requires one or more alternate keys.

In the “Integration Composer Classes and Properties Example” on page 15, **Displaytype, Makemodel, Manufacturer** and **Serialnumber** are alternate keys for the class **Display**.

Generated Value (GV)

A generated value property (GV) is a property whose value Integration Composer generates automatically when you execute a mapping for the target data source. Defining a property as a generated value is meaningful only for target data schemas.

In the “Integration Composer Classes and Properties Example” on page 15, the properties **Changedate** and **Createdate** are generated values for the class **Display**.

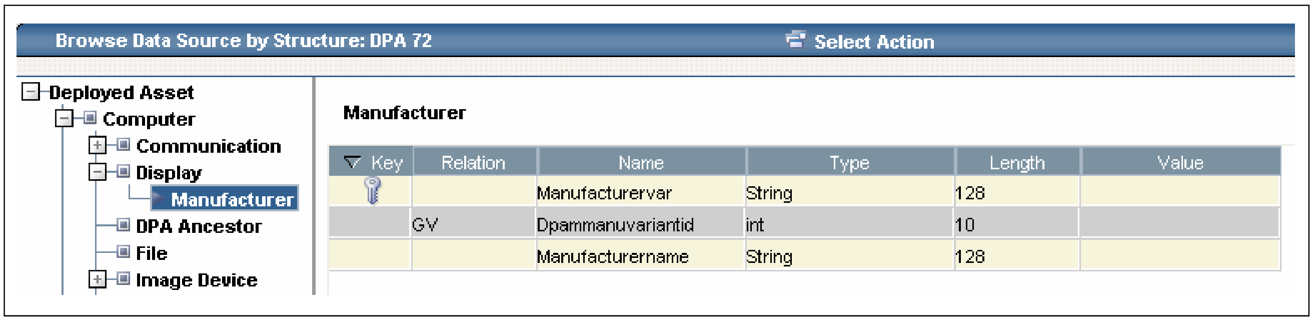
Reference Property (Ref)

A reference property is a property that points to a primary key property in a reference class. When Integration Composer executes a mapping, it copies the value for a reference property from the primary key of the reference class instance.

In the "Integration Composer Classes and Properties Example" on page 15, the property **Manufacturer** in the class **Display** is a reference to the class **Manufacturer**.

When you create a mapping, Integration Composer copies the value of the primary key in the class **Manufacturer**, which is **Manufacturervar** (as shown in the following figure), to the **Manufacturer** property in the **Display** class.

Reference Property Example



Manufacturer

Key	Relation	Name	Type	Length	Value
🔑		Manufacturervar	String	128	
	GV	Dpammanuvariantid	int	10	
		Manufacturername	String	128	

Required Properties

In some cases Integration Composer requires a value for a property, meaning that it cannot be null. If a property requires a value, the Integration Composer user interface displays the property with a yellow background in mappings. Because those properties must contain a value because of mapping execution, you must define expressions that produce not null values for those properties when you create mappings.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

For numeric properties, Integration Composer does not require an expression. For Integers, Integration Composer inserts a default value of zero (0) into the target. For Double and Float, it inserts a default value of 0.0.

Access and Navigation 2

This chapter describes how to access Integration Composer and navigate the user interface.

Accessing the User Interface

To access Integration Composer, first install the application on a server. For the hardware, software, and other requirements to run Integration Composer and for installation instructions, see the installation documentation.

To access Integration Composer, log in using the IBM Control Desk database user ID and password. You must have database administrative rights to access the user interface. Integration Composer stores the database user IDs that you enter when defining connectivity to the source and target data sources, but it does not store the passwords.

To open Integration Composer, complete the following steps:

1. From the Start menu on the desktop, select **Integration Composer>IBM Integration Composer**. The Integration Composer log-in window opens.
2. In the **Username** field, type a user name.
3. In the **Password** field, type a password.

   NOTE Use the same user ID and password that you use to log in to the IBM Control Desk database.

4. Click **Log In**. Integration Composer displays the IBM Integration Composer window.

Navigating the User Interface

After you log in to the user interface, Integration Composer displays the IBM Integration Composer window.

You can view Integration Composer best with a screen resolution of 1024x768.

The IBM Integration Composer window lists three menus from which you can select actions that you want to perform:

- Data Source **–** lets you work with data sources.

- Mapping – lets you work with mappings.
- Data Schema – lets you work with data schemas.

The following table describes the actions available in the IBM Integration Composer window.

Item	Let’s you…	See this section of the guide:
Data Source		
Define New Data Source	Define a data source, specify database connectivity information, and specify bidirectional layout settings.	“Defining a New Data Source” on page 23.
Browse Data Source by Structure	Navigate through a data schema using a tree and associated table view.	“Browsing a Data Source by Structure” on page 26.
Browse Data Source by Data	Navigate through a data schema using a tree and associated table view. If data exists, Integration Composer displays instances in the tree view and instance data in the table view.	“Browsing a Data Source by Data” on page 28.
Delete Data Source	Delete a data source if you no longer need it and if no mapping currently uses it.	“Deleting a Data Source” on page 34.
Close Data Source Connection	Close a data source connection if you no longer need it in the current session.	“Closing a Connection to a Data Source” on page 33.
Mapping		
Create New Mapping	Associate a *source* data source and *target* data source with a mapping. Import and export a mapping. Create mapping expressions.	“Creating a New Mapping” on page 43.
Open Existing Mapping	View or modify an existing mapping. Import and export a mapping. Create mapping expressions.	“Opening an Existing Mapping” on page 45.
Delete Mapping	Delete a mapping if you no longer need it.	“Deleting a Mapping” on page 49.
Delete Mapping Last Scan History	Delete the last scan dates for top-level objects in the source database associated with the selected mapping. If you modify a mapping, you must delete the last scan history for changes to take effect.	“Creating Effective Mappings” on page 58.
Data Schema		
Define New Data Schema	Define a new data schema and specify its data source connection parameters. Add classes, properties, and relationships to a data schema. Import and export data schemas.	“Creating Data Schemas” on page 62.
Open Existing Data Schema	View or modify an existing data schema. Export a data schema file.	“Opening an Existing Data Schema” on page 87.

Item	Lets you...	See this section of the guide:
Delete Data Schema	Delete a data schema if you no longer need it.	“Deleting a Data Schema” on page 103.

Defining Source and Target Data Sources

3

Integration Composer lets you create mappings that you can use to transform data and transfer it from a *source* data source to a *target* IBM Control Desk database. Before you can work with data sources, you must establish connections between Integration Composer and the source and target databases. Integration Composer lets you create data source definitions that associate a data schema with a specific data source and specify the parameters for connecting to the data source. After you define a data source, you can use this connection information each time you want Integration Composer to connect to the database.

In Integration Composer a data source can be a source of data or a target for data. Before you can create a mapping, you must define a data source for both the *source* database and the *target* database. This chapter discusses data sources; it explains how to view data sources and their properties, define a new data source, close a connection to a data source, and delete a data source.

NOTE Throughout this chapter, the term **source** refers to the *source* data source and the term **target** refers to the *target* IBM Control Desk data source.

Defining a New Data Source

To connect Integration Composer to a data source, you define a data source connection that specifies how to connect to the data source. Integration Composer uses JDBC drivers or an application programming interface (API) to establish connection to data sources. You can specify data source connection parameters when defining a data source or when defining a data schema.

After you define data source connection parameters, Integration Composer stores the connection information and displays those parameters when you attempt to connect to the data source. The only parameter that Integration Composer requests is the password.

In an Integration Composer session, if you connect to a data source, Integration Composer keeps the data source connection open throughout the session unless you complete one of the following steps:

- Close the connection using the **Close Data Source Connection** option in the Data Source menu in the IBM Integration Composer window.
- Delete the open data source.

Before you create a mapping, you must define a data source for both the source data and the target data.

When you define a data source, you perform the following tasks:

- Select a data schema to associate with the data source.
- Name the data source.
- Specify the parameters for connecting to the data source.
- If using Arabic or Hebrew, specify bidirectional layout formats to use for the database.

To define a data source, complete the following steps:

1 Log in to Integration Composer.

2 In the IBM Integration Composer window, choose **Define New Data Source**. Integration Composer displays the Data Schema page in the Define a New Data Source window. This page displays data schemas delivered with Integration Composer as well as any data schemas that you create using the Data Schema features in the application.

   NOTE In the Define a New Data Source window, you can click **Back** to review or change previous selections. To cancel this procedure and return to the IBM Integration Composer window, click **Cancel**.

3 On the **Data Schema** page, select a data schema, then click **Next**. Integration Composer displays the Data Source page.

4 In the **Data Source** field, type a name for the data source (the name must have at least two characters), then click **Next**. Integration Composer displays the Connection Information page. Data source names are case sensitive; for example, Deployed Assets is different from DEPLOYED ASSETS.

   If you enter the name of an existing data source, Integration Composer displays a dialog box informing you that the data source already exists and asking if you want to overwrite it. To overwrite the existing data source, click **Yes**. Click **No** if you do not want to overwrite the existing data source. Integration Composer closes the dialog box, and you can enter a different data source name on the Data Source page.

5 On the Connection Information page, in the **Connection Method** field, select a connection method.

6 Enter the parameters for the connection method as required. The fields displayed depend upon the type of connection method selected. The following table lists some of the fields that Integration Composer might display.

Data Source Connection Parameters

Field	Description
Host Name	Host name for a data source. For the Configuration Discovery and Tracking API, the host name of the server on which the IBM Configuration Discovery and Tracking Server is installed.
Host Port	Port for the data source.
Host SID	Session identifier for the host (that is, the database instance name).
Database	IBM Control Desk Database name for the data source.
User Name	Database user name for the data source. For the Configuration Discovery and Tracking API, the user identifier to access the Configuration Discovery and Tracking Server.
Password	Database password for the data source. For the Configuration Discovery and Tracking API, the password associated with the user login account.
Table Owner	Database schema name or database schema owner.
Trusted Location	Fully qualified path of the SSL certificate file to use to connect to a server such as the Configuration Discovery and Tracking Server. For example, c:\Integration Composer\...\jssecacerts.cert
Use SSL	Check box that specifies whether the connection is an SSL (Secure Socket Layer) connection. If you select this check box, you must enter a value in the **Trusted Location** field.
URL	URL address to access a database instance or server, such as the Configuration Discovery and Tracking Server.

7 Optional: If you have installed Integration Composer in Arabic or Hebrew and want to define bidirectional layout formats for the database that you are connecting to, click **Bidi Layout Format**. For information about how to specify bidirectional layout formats, see "Defining Bidirectional Data Normalization" on page 182.

8 Optional: To test the connection to the data source, click **Test Connection** and select one of the following options:

- If Integration Composer cannot establish a connection, it displays an explanatory message. Click **OK**. Integration Composer closes the Test Connection dialog box. Review the values for the connection parameters and retry the connection.

- If Integration Composer establishes a connection, it displays a confirmation message. Click **OK.** Integration Composer closes the Test Connection dialog box.

NOTE The Test Connection feature lets you test only the connection without invoking any additional Integration Composer processes.

9 On the Connection Information page, click **Finish**. Integration Composer saves the data source and displays a Save confirmation dialog box.

10 In the Save confirmation dialog box, click **OK**. Integration Composer displays the IBM Integration Composer window.

NOTE If Integration Composer does not save the data source successfully, it displays one or more error messages. Click **OK**. Resolve the problem and attempt to save the data source again.

Browsing a Data Source

Before you create a mapping between two data sources, you should review the data schemas for both the source and the target to analyze the class relationships and properties. For more information about data schemas, see "Introduction to Data Schemas," on page 13.

Depending on the part of the data source that you want to review, select one of the following options:

- Use **Browse Data Source by Structure** to review the data source’s data schema and classes.
- Use **Browse Data Source by Data** to review both classes and data instances.

Whether you are browsing by structure or by data, the process for opening a data source that you want to view is essentially the same. Before you can view a data source, you must be connected to the IBM Control Desk database. Consequently, when you view a data source, Integration Composer prompts you to set up a data source connection.

When you open a data source, the data source remains open throughout the Integration Composer session unless you perform one of the following steps:

- Close the data source using the **Close Data Source Connection** option in the IBM Integration Composer window.
- Delete the open data source.

Browsing a Data Source by Structure

When you browse a data source by structure, Integration Composer displays the classes and properties defined by the data schema for the data source.

To browse a data source by structure, complete the following steps:

1 Log in to Integration Composer and, in the IBM Integration Composer window, choose **Browse Data Source by Structure**. Integration Composer

displays the Data Schema page in the Open Data Source window. This page lists the available data schemas.

2 On the **Data Schema** page, select a data schema, then click **Next**. Integration Composer displays the Data Source page. This page lists the data sources that you defined for the selected data schema.

3 On the Data Source page, select a data source, then click **Next** and select one of the following options:

- If the data source is already open, Integration Composer displays the Browse Data Source by Structure window. Go to step 8 on page 27.
- If the data source is not open, Integration Composer displays the Connection Information page in the Open Data Source window. Go to step 4 on page 27.

4 On the Connection Information page, in the **Connection Method** field, accept the default connection method or select a different method from the drop-down list.

5 Enter the parameters for the connection method as required. The parameters that you enter on this page depend on the connection method that you use to connect to a database. You can accept the defaults established during the last connection to the data source, or you can update the fields. You must enter a data source password. For more information about fields displayed on this page, see step 6 on page 24.

6 Optional: To test the connection to the data source, click **Test Connection** and select one of the following options:

- If Integration Composer cannot establish a connection, it displays an explanatory message. Click **OK**. Integration Composer closes the Test Connection dialog box. Review the values for the parameters and retry the connection.
- If Integration Composer establishes a connection, it displays a confirmation message. Click **OK**. Integration Composer closes the Test Connection dialog box.

7 In the Open Data Source window, click **Finish**. Integration Composer opens the selected data source in the Browse Data Source by Structure window.

8 Click the + icon to expand the tree to view child and reference classes.

9 To view the properties of the class, click the class. Integration Composer displays the properties in the table view on the right side of the window.

For information on viewing property details and using the features available for this window, see “Viewing Properties of a Data Source” on page 30.

10 After you view the data source, select **Close** from the Select Action menu to close the data source. Integration Composer closes the Browse Data Source by Structure window and displays the IBM Integration Composer window.

Browsing a Data Source by Data

When you select **Browse Data Source by Data** to view instances, you use the same procedure that you used to select a data source to browse by structure. However, the tree view on the Browse Data Source by Data window includes actual data instances. When you expand the tree view, Integration Composer displays the first ten instances. When you expand an instance, Integration Composer displays the classes for that instance. When you select a class or instance, Integration Composer highlights it with a blue background and displays any associated properties and property values in the table view on the right.

To browse a data source by data, complete the following steps:

1. Log in to Integration Composer and, in the IBM Integration Composer window, choose **Browse Data Source by Data**. Integration Composer displays the Data Schema page in the Open Data Source window. This page displays data schemas delivered with Integration Composer as well as any data schemas that you created using the Data Schema functions in the application.

2. On the Data Schema page, select a data schema, then click **Next**. Integration Composer displays the Data Source page. This page displays the data sources that you defined for the selected data schema.

3. On the Data Source page, select a data source, then click **Next** and select one of the following options:

    - If the data source is already open, Integration Composer displays the Browse Data Source by Data window, and you can go to step 8.

    - If the data source is not open, Integration Composer displays the Connection Information page in the Open Data Source window, and you can go to step 4.

4. On the Connection Information page, in the **Connection Method** field, accept the default connection method or select a different method from the drop-down list.

5. Optional: Update the parameters for the selected connection method. The parameters that you enter on this page depend on the method that you use to connect to database. You can accept the defaults established during the last connection to the data source, or you can update the fields. You must enter a data source password.

6. Optional: To test the connection to the data source, click **Test Connection** and select one of the following options:

    - If Integration Composer cannot establish a connection, it displays an explanatory message. Click **OK**. Integration Composer closes the Test Connection dialog box. Review the values for the parameters and retry the connection.

    - If Integration Composer establishes a connection, it displays a confirmation message. Click **OK**. Integration Composer closes the Test Connection dialog box.

7 In the Open Data Source window, click **Finish**. Integration Composer opens the selected data source in the Browse Data Source by Data window.

8 Click the + icon to expand the tree to view child and reference classes. To view details about an instance, click it in the tree view. The details of the instance appear in the table view on the right side of the window.

Note that classes are displayed in bold type whereas instances are not.

To display the previous or next instance (if any) of the same class, click **Back** or **Next**. If these buttons are unavailable, no other instances exist in that class.

9 After you view the data source, select **Close** from the Select Action menu to close the data source. Integration Composer closes the Browse Data Source by Data window and displays the IBM Integration Composer window.

Choosing Specific Instances to View

From the Browse Data Source by Data window, you can select specific instances of a class for viewing. When you select specific instances, Integration Composer displays only selected instances in the Browse Data Source by Data window. For example, you might want to view only instances of network devices, not computers or network printers.

To display specific instances of a class, complete the following steps:

1 In the Browse Data Source by Data window, select the desired class and right- click the class name.

2 Click **Choose Instances to show**. Integration Composer displays the Select Instances to Show dialog box, listing the available instances for the selected class.

3 Choose one of the following options:

- Select one or more instances to view:
  - To select a series of instances, use **Shift+Click**.
  - To select separate instances, use **Ctrl+Click**.
  - To select all instances, click **Select All**.
- To narrow the search, complete the following steps:

  a Click **Search**. Integration Composer displays a Search dialog box.

  The Search dialog box displays the key property field or fields for the class selected. The fields displayed in the search box vary depending on the class selected.

  b In this dialog box, you can search for specific instances. If you are looking at Deployed Assets, for example, you can enter Computer in the **Assetclass** field, and Integration Composer selects all computers in the Select Instances to Show dialog box.

  Integration Composer searches using a “like” operator and not an exact search. For example, you can enter **comp** in the **Assetclass** field, and Integration Composer retrieves all values that contain the string

comp, including computers, component, etc. The search is not case sensitive.

c To display the selected instances, click **OK**. Integration Composer displays the Select Instances to Show dialog box. Integration Composer highlights the instances selected in brown.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

▯ To clear the choices, click **Deselect All**.

▯ To exit the Select Instances to Show dialog box and return to the Browse Data Source by Data window without selecting, click **Cancel**.

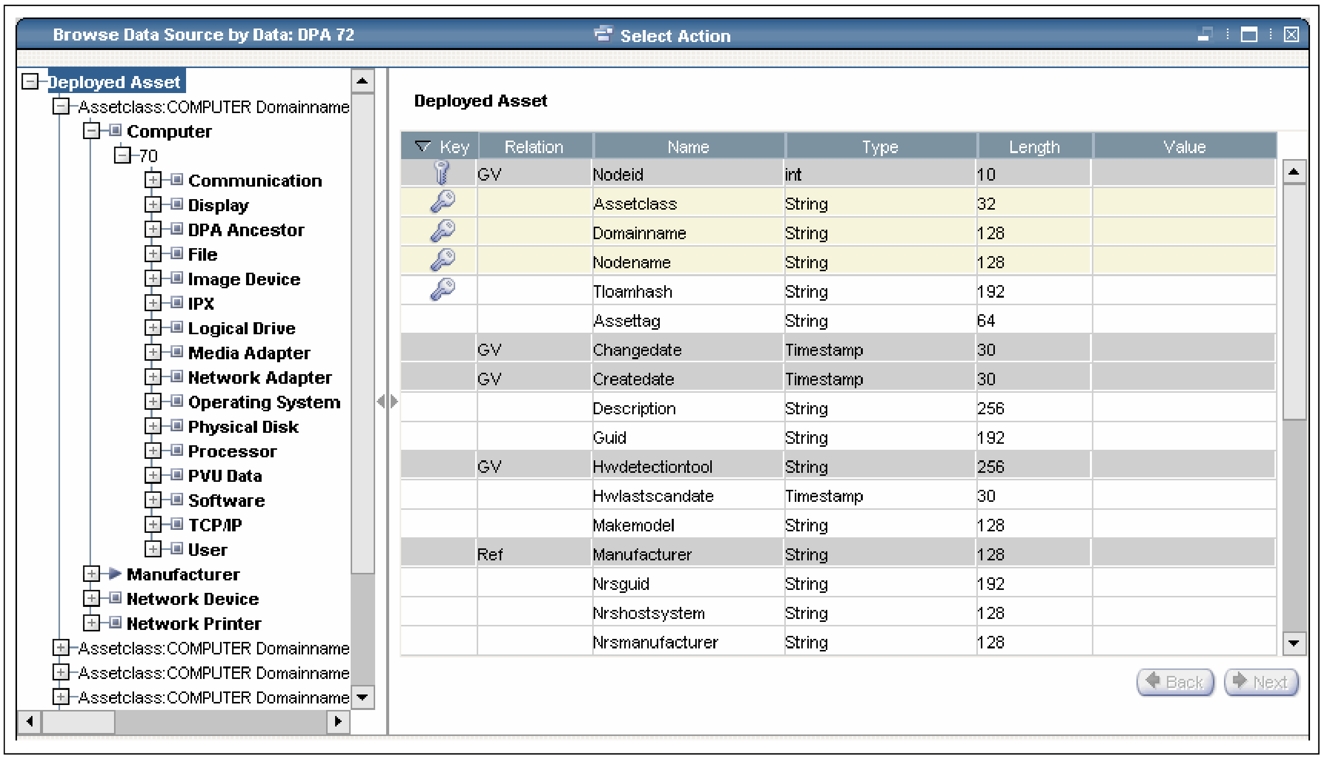
4 In the Select Instances to Show dialog box, after you select the instances to show, click **OK**. Integration Composer displays the instances selected in the Browse Data Source by Data window.

5 Optional: To view the selected instances, expand the tree view for the class. For information on viewing property details and using the features available for the Browse Data Source by Data window, see “Viewing Properties of a Data Source” on page 30.

Viewing Properties of a Data Source

To view the properties of a class or instance, select any class or instance in the tree view; the properties of the selected class appear in the table view on the right side, as shown in the following figure.

Viewing Properties of a Data Source



Deployed Asset

Key	Relation	Name	Type	Length	Value
🔑	GV	Nodeid	int	10	
🔑		Assetclass	String	32	
🔑		Domainname	String	128	
🔑		Nodename	String	128	
🔑		Tloamhash	String	192	
		Assettag	String	64	
	GV	Changedate	Timestamp	30	
	GV	Createdate	Timestamp	30	
		Description	String	256	
		Guid	String	192	
	GV	Hwdetectiontool	String	256	
		Hwlastscandate	Timestamp	30	
		Makemodel	String	128	
	Ref	Manufacturer	String	128	
		Nrsguid	String	192	
		Nrshostsystem	String	128	
		Nrsmanufacturer	String	128	

Both the Browse Data Source by Structure and the Browse Data Source by Data windows are divided into two panes—a tree view on the left and a table view on the right.

To resize the panes, position the cursor over the bar that separates the panes until the pointer changes to a Horizontal Resize Cursor (▯); then click the mouse device and drag to the right or left to increase or decrease the size of a pane.

To close the window, select **Close** from the Select Action menu.

Tree View

The tree view lists classes and, if you are browsing the data source by data, instances for the selected data source in a hierarchical structure that shows class relationships. Integration Composer displays class names in bold; instances are in plain text. When you select a class or instance in the tree, Integration Composer highlights it with a blue background and displays data about the class or instance in the table view. Click the + icon to expand a class or instance. Click the – icon to collapse a class or instance.

Table View

The table view lists the properties of a selected class. In the preceding figure, the class Deployed Asset is selected; the table view displays properties for that class. Integration Composer displays the following information for each class property:

Column	**Description**
Key	Indicates whether the property is a key property. 🔑 indicates that the row is a primary key. 🔑 indicates that the row is an alternate key
Relation	Indicates whether the property is related to another class or instance. The following relations are possible: ▯ FK – indicates that this is a foreign key. ▯ Ref – indicates that this is a reference relationship. ▯ GV – indicates that Integration Composer generates this value for this property.
Name	Name of the selected property.
Type	Java data type for the selected property.
Length	Length of the selected property. For string types, this field specifies the maximum number of characters.
Value	Value for the selected property.

For more information about key properties and relationships, see “Classes, Properties, and Instances” on page 13.

Data in the table view is color coded:

- Brown indicates that a row is selected.
- Yellow indicates the property in that row cannot have a null value.
- Gray indicates that you cannot edit this row when creating a mapping.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

You can organize data in the table view in the following ways:

- **Resize table columns –** To resize columns, position the cursor between the column headers until the pointer changes to a Horizontal Resize Cursor (▯); then click the mouse device and drag the column line left or right to decrease or increase the column width.

- **Sort rows –** To sort rows in ascending or descending alphabetical order, click the column header. A triangle ▲ appears in the column header denoting the ascending alphabetical order of the records. The up and down triangles function like a toggle switch; click the column header again to sort records for that column in descending alphabetical order.

Select Action Menu

In the title bar of the Browse Data Source by Structure and Browse Data Source by Data windows, there is a Select Action menu that lets you select actions that you can perform in these windows. The following table lists actions available from the Select Action menu.

Action	Description
Tree Search	Opens a Find dialog box to let you search for a specific item in the navigation tree.
Search Again	Searches for the next item that matches the search string and highlights that item. If Integration Composer finds no matching items, it displays a message indicating that no items were found.
Close	Closes the window.

Searching the Tree View

To locate a specific class or instance in the tree, complete the following steps:

1. In the tree view in the Browse Data Source by Structure or Browse Data Source by Data window, select a class or instance.

2. After selecting an item, select **Tree Search** from the Select Action menu to display the Find dialog box.

3. In the Find dialog box, enter the value that you want to search for.

4. Click **OK**. Integration Composer highlights the first value in the tree that matches the search criteria and displays the details for that class or instance in the table view.

5. Optional: You can select **Search Again** from the Select Action menu to find additional instances. When you select **Search Again**, Integration Composer finds additional instances for classes or instances that are expanded in the tree view.

Closing a Connection to a Data Source

Sometimes you might want to close a connection to a data source and remain in an Integration Composer session. The following instructions explain how to close a data source connection.

To close a data source but continue working in Integration Composer, complete the following steps:

1. Close any open windows that are currently using the data source that you want to close.
2. In the IBM Integration Composer window, choose **Close Data Source Connection**. Integration Composer displays the Select Data Source Connection(s) to Close window.
3. In the Select Data Source Connection(s) to Close window, select one or more data source connections to close:
   - To select a series of data sources, use **Shift+Click**.
   - To select separate data sources, use **Ctrl+Click**.
   - To select the entire list, click **Select All**.
   - To cancel the selection of all data sources in the list, click **Deselect All**.
4. After you select one or more data sources that you want to close, click **Close Connection**. Integration Composer displays a Close Data Source Connection confirmation dialog box.
5. In the Close Data Source Connection dialog box, select one of the following options:
   - To close the data source connection, click **Yes**. Integration Composer closes the connections to the selected data sources and displays the IBM Integration Composer window.

     NOTE If the data source does not close successfully, Integration Composer displays an error message. Click **OK**. Resolve the problem and attempt to close the data source again.
   - To keep this data source connection open, click **No**. Integration Composer closes the Close Data Source Connection confirmation dialog box and displays the IBM Integration Composer window.
   - To cancel closing the selected data source and select a different data source to close, click **Cancel**. Integration Composer closes the Close Data Source Connection confirmation dialog box and displays the Select Data Source Connection(s) to Close window so that you can select a different data source to close.

Deleting a Data Source

Occasionally, you no longer need a data source. This section explains how to delete a data source permanently.

NOTE You cannot delete a data source if it is used in a mapping. You must first delete the related mapping. For more information about deleting mappings, see "Deleting a Mapping" on page 49. If a deleted data source is required for future use, you must add it again.

To delete a data source, complete the following steps:

1. Before you attempt to delete a data source, close any open windows using the data source that you want to delete.

2. In the IBM Integration Composer window, choose **Delete Data Source**. Integration Composer displays the Select Data Source(s) to Delete Permanently window.

3. In the Select Data Source(s) to Delete Permanently window, select one or more data source connections to delete:

    - To select a series of data sources, use **Shift+Click**.

    - To select separate data sources, use **Ctrl+Click**.

    - To select all data sources in the list, click **Select All**.

    - To cancel the selection of all data sources in the list, click **Deselect All**.

4. After selecting, click **Delete**. Integration Composer displays a Delete Data Source confirmation dialog box.

5. In the Delete Data Source dialog box, select one of the following options:

    - To delete the data source, click **Yes**. Integration Composer deletes the selected data source(s) and displays the IBM Integration Composer window.

        NOTE If Integration Composer cannot delete the data source successfully, it displays an error message. Click **OK**, resolve the problem, and attempt to delete the data source again.

    - To keep this data source, click **No**. Integration Composer closes the Delete Data Source confirmation dialog box and displays the IBM Integration Composer window.

    - To cancel deletion of the selected data source and select a different data source to delete, click **Cancel**. Integration Composer closes the Delete Data Source confirmation dialog box and displays the Select Data Source(s) to Delete Permanently window so that you can select a different data source to delete.

Mapping Data Sources 4

To import data from an external data source into a target database, you create a mapping that sets up the parameters for transforming data from the source format to the target format.

This chapter introduces Integration Composer mappings and explains how to create a new mapping, open an existing mapping, execute a mapping, export a mapping, import a mapping, and set up a mapping to run unattended.

NOTE Throughout this chapter, the term **source** refers to the *source* data source and the term **target** refers to the *target* IBM Control Desk database.

Mappings Overview

To migrate data from an external data source into a target database, you create a mapping that defines how to transform data from the source format to the target format. A mapping is a set of expressions that tell Integration Composer how to create data in the target using information from a source. For each property that you want to import, you define an expression in the target data schema that specifies how to transform the data for that property when Integration Composer imports the data from the source into the target.

To facilitate data migration, Integration Composer includes adapters to transform and import data provided by various asset- and systems- management tools. The adapters provide predefined mapping expressions that let you transform data and transfer it from a database created by a discovery tool into the IBM Control Desk database. You can import an adapter mapping into Integration Composer and modify it to suit your business needs. Then you can execute the mapping to import data into the target. IBM provides documentation for each Integration Composer adapter, which explains how to use it to import data.

To create an Integration Composer mapping, you specify the following parameters:

- Source data source
- Target data source
- Mapping name

After you create a mapping, you can import the mapping for an Integration Composer adapter and use the predefined mapping expressions in the adapter, create new mapping expressions, or modify existing expressions using the features in the Integration Composer Mapping window. When you install Integration Composer, you should import the mappings that you want to use.

Integration Composer also lets you export a mapping and save it as text file with an Integration Composer (.fsn) extension if you want to maintain mappings outside of the Integration Composer repository.

Mapping Functions

The mapping features in Integration Composer let you perform the following functions:

- Create a new mapping
- Create a new mapping by opening an existing mapping and saving it under a different name
- Delete a saved mapping
- Delete last scan history
- Export a mapping
- Import a mapping
- View and edit an existing mapping

Mapping Execution

To execute an Integration Composer mapping, you must run a script located in the bin directory of the Integration Composer installation directory. For more information about executing mappings, see "Executing a Mapping" on page 51.

As Integration Composer executes a mapping, for each object in the source and target, it creates Java source code and compiles the source code. When Integration Composer completes a top-level object, including all its children and reference classes, it imports the data for that object to the database.

If you stop and then restart mapping execution and if a last scan date exists for the source, Integration Composer begins where it left off and moves only objects that were not previously committed to the database. Avoid stopping the mapping if at all possible.

Insert Only

If appropriate and if your source data contains a last scan date, you can create a mapping that only inserts records for objects that were not imported in previous runs. To do this, you must select **Insert Only** from the Select Action menu in the Mapping window when you create the mapping.

When Integration Composer imports data using a mapping with the **Insert Only** flag set to true, Integration Composer updates a record only if a *new* root class is found. In other words, if a new computer or root class is found, then all records associated with that root class will be updated. No records will be updated for the existing root classes even if new data is available for them.

Updates

To determine which object or attribute records to update, Integration Composer uses a last scan time stamp. When Integration Composer processes a new object, it records the data for that source object in the Integration Composer repository. On subsequent mapping executions, Integration Composer compares the last scan date in the Integration Composer repository with the scan date in the *source* data source and performs one of the following actions:

- If the date for an object in the source is earlier than or is the same as the last scan date in the repository, Integration Composer skips the source instance.
- If the date for an object in the source occurs after the last scan date in the repository, Integration Composer processes the expressions for the source instance and updates the last scan date in the repository.

By doing this, Integration Composer ensures that it processes **only the objects that have changed** since the last scan date.

If you modify a mapping and you want to implement the change, you might want **all** data processed. To accomplish this, you must delete the last scan history. If you delete the last scan history, Integration Composer imports all the source data that is mapped into the target.

Deletions

For some targets, Integration Composer deletes records when importing data into the target.

CCMDB Installations

For information about the way Integration Composer handles deletions for Change and Configuration Management Database (CCMDB) adapters, see the documentation provided with IBM Control Desk.

IBM Control Desk Installations

When Integration Composer Imports Deployed Asset data, components of Computers, Network Printers, and Network Devices are deleted if the corresponding record no longer exists in the source. However, top-level Computer, Network Printer, and Network Device records are not deleted. Data from reference classes, such as Manufacturer and Software in Deployed Assets, is not deleted.

If a top-level object no longer exists in the source and you no longer want the data in the target, you can use the Deployed Assets module applications (Computers, Network Printers, and Network Devices) to delete computer, network device, and printer records from the IBM Control Desk database. For information about deleting records from the database, refer to online help for the Computers, Network Devices, or Network Printers applications in IBM Control Desk.

NRS GUIDs and Deletions

If you use Naming and Reconciliation Service (NRS) to identify deployed assets, Integration Composer uses the NRS GUID to determine whether a deployed asset already exists in the target database. Deployed assets are considered a match if NRS determines that their NRS properties have the same value for one or more naming rules; for example, the signature value is the same for both deployed assets.

If a match is found and there is an NRS GUID conflict (that is, the same NRS GUID exists for both the existing deployed asset and the one being processed), then the existing deployed asset and the associated child assets are deleted. The newly imported deployed asset is added, including the NRS GUID.

For more information about NRS, see Appendix D – *Naming and Reconciliation Service (NRS)*.

Mapping Encryption

The executeMapping.properties file stores user identifiers and passwords that are used to access the Integration Composer repository and the source and target data sources when mappings are executed. This file can be used to run the executeMapping.bat or executeMapping.sh files securely.

The following table describes the properties in this file.

Property	Description
MAPPINGNAME	Name of the mapping. Use the name that you assign to this mapping when you create the mapping.
REPOSITORYUSER	User identifier for the Integration Composer repository.
REPOSITORYPWD	Password for the Integration Composer repository.
SOURCEUSER	User identifier for the source data source for the mapping.
SOURCEPWD	Password for the source data source for the mapping.
TARGETUSER	User identifier for the target data source for the mapping.
TARGETPWD	Password for the target data source for the mapping.

To enhance security when executing mappings, administrators can run a script that encrypts the passwords in this file.

To encrypt an executeMapping.properties file, administrators specify user names and passwords in the properties file and then run one of the following encryption scripts:

- encryptExecuteMappingProperties.bat (Microsoft Windows systems)
- encryptExecuteMappingProperties.sh (UNIX systems)

The encryption scripts are in the bin folder of the Integration Composer installation directory.

To run the script, use the syntax shown in the following examples:

```
encryptExecuteMappingProperties.bat <file_name>
(Microsoft Windows)
```

or

```
encryptExecuteMappingProperties.sh <fully_qualified_file_name> (UNIX)
```

where the file name is the name of the executeMapping.properties file that you created for this mapping.

After the script is run, the executeMapping.bat file can run the mapping with the encrypted passwords.

Validation

By default, the Integration Composer encryption utility validates that the passwords are correct by attempting to connect to the data sources that are specified in a mapping.

To skip the step that validates data source and target connections, use the -s parameter, as shown in the following examples:

```
encryptExecuteMappingProperties.bat -s <file_name> (Microsoft
Windows)
```

or

```
encryptExecuteMappingProperties.sh -s <fully_qualified_file_name> (UNIX)
```

Using the -s parameter will encrypt the file even if the connections are not successful.

The encryption utility will encrypt the values specified in the executeMapping.properties file without validating the connections.

Encrypting Multiple Files

If you want more than one properties file to use for different mapping executions, you can create multiple properties files by copying and renaming the executeMapping.properties file.

You can use the encryption script to encrypt multiple files at one time, as shown in the following examples:

```
encryptExecuteMappingProperties.bat [-s] <filename_1>
<filename_2>...<filename_n> (Microsoft
Windows)
```

or

```
encryptExecuteMappingProperties.sh  [-s]
<fully_qualified_filename_1>
<fully_qualified_filename_2>...<fully_qualified_filename_n> (UNIX)
```

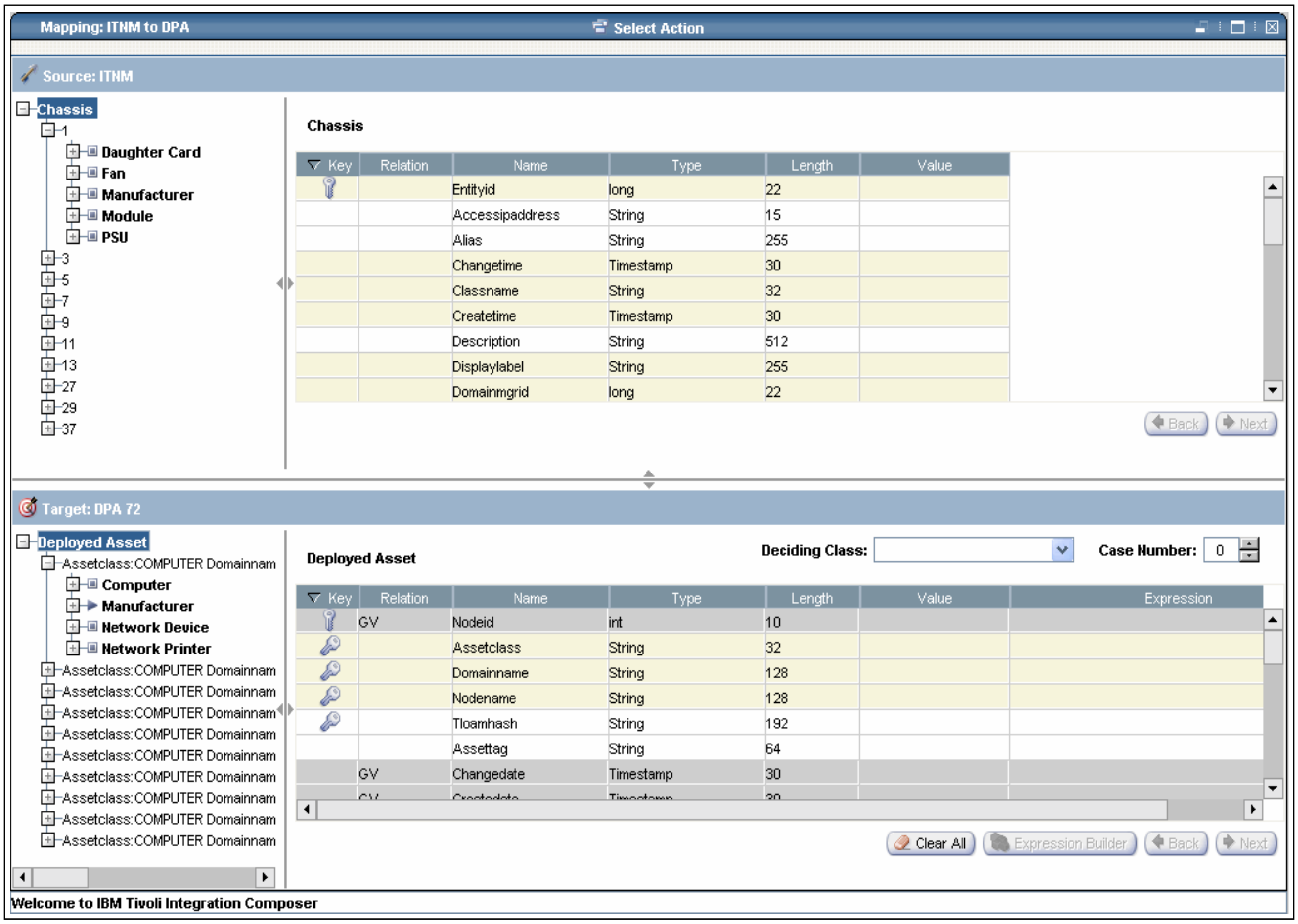
The -s option applies to all files. If you omit the -s, all files will be validated. If you include the -s, no files will be validated.

For more information about executing mappings see “Executing a Mapping” on page 51.

Mapping Window Features

The Mapping window lets you view both source and target data sources, as shown in the following figure.

Sample Mapping Window



Mapping: ITNM to DPA

Select Action

Source: ITNM

- Chassis
  - 1
    - Daughter Card
    - Fan
    - Manufacturer
    - Module
    - PSU
  - 3
  - 5
  - 7
  - 9
  - 11
  - 13
  - 27
  - 29
  - 37

Chassis

Key	Relation	Name	Type	Length	Value
🔑		Entityid	long	22	
		Accessipaddress	String	15	
		Alias	String	255	
		Changetime	Timestamp	30	
		Classname	String	32	
		Createtime	Timestamp	30	
		Description	String	512	
		Displaylabel	String	255	
		Domainmgrid	long	22	

Back Next

Target: DPA 72

- Deployed Asset
  - Assetclass:COMPUTER Domainnam
    - Computer
    - Manufacturer
    - Network Device
    - Network Printer
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam
  - Assetclass:COMPUTER Domainnam

Deployed Asset

Deciding Class: Case Number: 0

Key	Relation	Name	Type	Length	Value	Expression
🔑	GV	Nodeid	int	10		
🔑		Assetclass	String	32		
🔑		Domainname	String	128		
🔑		Nodename	String	128		
🔑		Tloamhash	String	192		
		Assettag	String	64		
	GV	Changedate	Timestamp	30		

Clear All Expression Builder Back Next

Welcome to IBM Tivoli Integration Composer

The Source pane in the top half of the window displays source data. The Target pane in the lower half of the window displays target data.

Each pane contains a tree view on the left that lists classes and instances as well as a detailed table view on the right. When you expand the source and target tree views on the left and select an instance or class in the source or target, Integration Composer displays the properties of the respective item in the table on the right. The Mapping window uses the same color coding and structural features used on the browsing windows. For information about these features, see “Viewing Properties of a Data Source” on page 30.

Both panes in the window provide the following navigation buttons:

- Back – You select this button to return to the previous sibling instance.

- Next – You select this button to advance to the next sibling instance.

To resize any of the panes, position the cursor over the bar that separates the panes until the cursor changes to a Horizontal Resize Cursor (); then click the mouse device and drag left, right, up, or down to change the size of a pane.

Expression Field

The table in the Target pane contains an additional column for expressions. The cells in this column function as text input fields. The **Expression** field contains the instruction that Integration Composer uses to transform data from the source format to the target format. You create a mapping by selecting a row in the table on the Source pane and entering a mapping expression into the Expression column for the corresponding property row in the table on the Target pane. In this way, you specify the class and property data in the source, associate it with a class and property in the target, and create instructions in the **Expression** field for transforming data from the source to the target.

Integration Composer provides the following ways to create expressions:

- **Drag and Drop Method –** You use the drag-and-drop feature to create an expression when the data in the source is transferred to the target field exactly as it is, and no transformation is required.

Expression Builder

- **Expression Builder –** The Expression Builder button in the Target pane opens the Expression Builder dialog box, which provides access to a library of predefined functions and boolean operators that facilitate creation of complex transformation expressions.

- **Typing an expression in the Expression field.**

For more information about using each of these methods, see Chapter 6, "Creating Expressions," on page 107.

In addition to the Expression Builder and drag-and-drop features, the Target pane in the Mapping window provides the following mapping features:

Deciding Class

- **Deciding Class Drop-down List –** Sometimes you must map more than one class in a source to a single class in the target. When you map multiple source classes to a single target class, Integration Composer populates the **Deciding Class** drop-down list with the classes mapped. You can select a deciding class from the drop-down list to designate which class controls the number of instances Integration Composer creates in the target. Integration Composer creates target instances based on the number of instances of the deciding class that exist in the source.

  If you map multiple properties in a source to a single class in the target but do not designate a deciding class, Integration Composer creates one instance in the target using the first instance in the source that meets the criteria.

Case Number

- **Case Number Field –** You use the case number feature when you must migrate data from multiple classes in the source into multiple instances in a single target class. The case number feature lets you create a set of expressions that apply on a case-by-case basis to the same target class. For a more detailed discussion of this feature, see “Setting Up Multiple Cases” on page 110.

Clear All

- **Clear All –** In the Target pane, you can click **Clear All** to clear all expressions listed for a selected target class. If multiple cases exist for this class, Integration Composer clears expressions only for the selected case; it does not clear expressions for other cases defined for the class.

If a reference class exists for a case, clearing the expression or expressions for the case does not delete the corresponding expressions in the reference class. You must go to the reference class and delete the expressions for that case.

If a child class exists for a case, clearing the expression or expressions for the case does not delete the corresponding expressions in the child class. You must go to the child class and delete the expressions for that case.

Mapping Window Actions

The following table lists actions available from the Select Action menu in the Mapping window.

Action	Description
Save	Saves the mapping.
Save As	Opens a Save Mapping As window to let you save the mapping with a new name.
Tree Search	Opens a Find dialog box to let you search for a specific item in the navigation tree.
Search Again	Searches for the next item that matches the search string and highlights that item. If Integration Composer finds no matching items, it displays a message indicating that no items were found.
Show Errors	Opens an Errors dialog box that displays information about Java parsing errors detected in the current mapping.
Export	Opens the Export Mapping dialog box to let you export a mapping to a text file.
Import	Opens the Import Mapping dialog box to let you import a mapping into Integration Composer.
Close	Opens a Close Mapping dialog box to let you close a mapping.
Insert Only	Specifies that when importing data into the target data source, Integration Composer only creates new records. It does not update existing records. Select this option if you want Integration Composer only to insert data. This feature only works on sources that contain a last scan date.

Mapping Process

In general, use the following sequence of operations to create and execute a mapping:

1. Select the Create New Mapping function in Integration Composer and specify a source, a target, and a name for the mapping.
2. Establish connections to the source and target databases. Integration Composer requests this information if one of the data sources is not open. This step is not always required; if the source and the target databases are already open, you do not have to establish the connection.
3. Import an Integration Composer adapter mapping or use the mapping features provided in the Integration Composer user interface to define expressions for transforming data from the source to the target.
4. Save and close the mapping.
5. Sign out of Integration Composer.
6. Execute the mapping using a command line.

Creating a New Mapping

A mapping is a set of expressions that transform data when Integration Composer imports it from an external source into a target. This section of the guide explains how to create a new mapping. If the data sources that you want to use in this mapping are not already open, as part of this procedure you must open the data sources for the source and target. Once you have created a mapping, you can import the mapping provided in an Integration Composer adapter or define mapping parameters by creating expressions to transform data from the source into target data. For additional information about creating expressions in a mapping, see Chapter 6, “Creating Expressions”, on page 107.

To create a new mapping, complete the following steps:

1. In the IBM Integration Composer window, choose **Create New Mapping**. Integration Composer displays the New Mapping window.
2. From the **Source** drop-down list of existing data sources, select the desired source.
3. From the **Target** drop-down list of existing and available data sources, select the target.
4. In the **Mapping Name** field, enter a new mapping name (maximum of 255 characters). Mapping names are case sensitive; for example, taddm to dpa is different from TADDM TO DPA.
5. Click **OK**. Integration Composer displays the Mapping window; or, if no data sources are open for the specified mapping, Integration Composer displays a Connection Information page in the Open Data Source window.

6 Select one of the following options:

- If Integration Composer displays the Mapping window, go to step 7 on page 44.

- If Integration Composer displays the Connection Information page on the Open <Source or Target> Data Source window, use the following procedure to complete the connection information:

  a On the Connection Information page in the Open Source Data Source window, either accept the defaults established during the last connection to the data source or update the fields.

  b Enter a data source password.

  c Click **Finish**.

  d On the Connection Information page in the Open Target Data Source window, either accept the defaults established during the last connection to the data source or update the fields as necessary.

  e Enter a data source password.

  f Click **Finish** to establish the target's connection. Integration Composer displays the Mapping window.

NOTE For more information about using the mapping window features, see "Mapping Window Features" on page 40.

7 In the Mapping window, set up a mapping by importing a mapping provided with an Integration Composer adapter or defining expressions to transform source data into the format required in the target.

For information about importing a mapping provided with an Integration Composer adapter, see the documentation for the adapter.

For information about how to define expressions, see Chapter 6, "Creating Expressions," on page 107.

8 After you create mapping expressions, from the Select Action menu, select **Save**. Integration Composer saves the mapping.

9 To close the Mapping window, from the Select Action menu, select **Close**. Integration Composer displays a Close Mapping dialog box.

10 In the Close Mapping dialog box, click **Yes**. Integration Composer closes the Mapping window and displays the IBM Integration Composer window.

NOTE After creating the mapping, you can open it and add to it or modify it at any time (see "Opening an Existing Mapping" on page 45.). For information about how to execute a mapping after you have created it, see "Executing a Mapping" on page 51.

Opening an Existing Mapping

After creating and saving a new mapping, you can open an existing mapping to view or edit expressions in the mapping. When opening an existing mapping, keep in mind the following:

- When you open a data source for the first time, you must define connection parameters on the Connection Information page of the Define a New Data Source window. When you open a data source on subsequent occasions, Integration Composer displays the previous database connection information as the default.
- If a **Ready** check box is selected in the Open Mapping window, the mapping has no syntax errors. Make sure that you check to see if the mapping is ready before you execute the mapping. The executeMapping script file that executes mappings does not check this field.

When Integration Composer executes a mapping, it processes only the data that has changed since the last scan date. If you use the following procedure to modify a mapping and you want to implement the change, you might want all data processed. To accomplish this, you must delete the last scan history before you execute the mapping. For more information about deleting the last scan history, see “Deleting Mapping Last Scan History” on page 50.

To open an existing mapping, complete the following steps:

1 In the IBM Integration Composer window, choose **Open Existing Mapping**. Integration Composer displays the Open Mapping window.

The Open Mapping window displays a table that lists the mappings currently available in Integration Composer. The table contains the following information about each mapping:

Column	Description
Mapping Name	Displays the name of the mapping.
Date	Displays the date when someone last saved the mapping.
Source	Displays the name of the source data source for the mapping.
Target	Displays the name of the target data source for the mapping.
Ready	Indicates whether the mapping is ready for execution; that is, the mapping has no errors. If the check box is selected, the mapping is ready for execution.
Insert Only	Indicates that when importing data into the target data source, Integration Composer only creates new records. It does not update existing records.

2 In the Open Mapping window, click a row to select the desired mapping. Integration Composer populates the **Mapping Name** field with the mapping selected.

3 In the Open Mapping window, click **OK.** Integration Composer displays the Mapping window; or, if no data sources are open for the specified mapping, Integration Composer displays a Connection Information page on the Open Data Source window.

NOTE To exit the Open Mapping window without opening a mapping, click **Cancel**.

4 Select one of the following options:

- If Integration Composer displays the Mapping window, go to step 5 on page 46.
- If Integration Composer displays the Connection Information page on the Open <Source or Target> Data Source window, use the following procedure to complete the connection information:

  a On the Connection Information page in the Open Source Data Source window, either accept the defaults established during the last connection to the data source or update the fields.

  b Enter a data source password.

  c Click **Finish**. Integration Composer displays either the Mapping window or the Connection Information page in the Open Target Data Source window. If Integration Composer displays the Mapping window, go to step 5. If Integration Composer displays the Connection Information page in the Open Target Data Source window, go to step d.

  d On the Connection Information page in the Open Target Data Source window, either accept the defaults established during the last connection to the data source or update the fields as necessary.

  e Enter a data source password.

  f Optional: If you have installed Integration Composer in Arabic or Hebrew and want to define bidirectional layout formats for the database that you are connecting to, click **Bidi Layout Format**. For information about how to specify bidirectional layout formats, see “Defining Bidirectional Data Normalization” on page 167.

  g Click **Finish**. Integration Composer displays the Mapping window.

5 In the Mapping window, you can create new expressions or modify existing expressions. For more information about working with expressions, see Chapter 6, “Creating Expressions”, on page 107.

NOTE For an explanation of the mapping window features and various mapping methods, see “Mapping Window Features” on page 40.

6 After completing the expressions, from the Select Action menu, select **Save**. Integration Composer saves the mapping.

NOTE To save the changes as a new mapping, from the Select Action menu, select **Save As**. Integration Composer displays a Save Mapping As window. In the **Mapping Name** field in this window, type a new name for the mapping and click **OK**. Integration Composer saves the changes with the new mapping name. For instance, if you open mapping A and save it as B, Integration Composer saves the changes as mapping B and keeps mapping B open for editing. Mapping A will still exist in its original form.

7. To close the Mapping window, from the Select Action menu, select **Close**. Integration Composer displays a Close Mapping dialog box.

8. In the Close Mapping dialog box, click **Yes**. Integration Composer closes the Mapping window and displays the IBM Integration Composer window.

NOTE For information about how to execute a mapping after you have created it, see “Executing a Mapping” on page 51.

Viewing Mapping Errors

From the Integration Composer Mapping window Select Action menu, you can select **Show Errors** to view any errors in the open mapping. The Show Errors function displays Java parsing errors but not compilation errors.

Integration Composer generates compilation errors only when it executes a mapping. To view compilation errors, you must view the Integration Composer log files. For information about log files, see “Logging Properties File (logging.properties)” on page 135.

To view Java parsing errors in a mapping, complete the following steps:

1. From the Select Action menu in the Integration Composer Mapping window, select **Show Errors**. Integration Composer opens an Errors dialog box to display any errors in the mapping.

2. When you finish viewing the errors, click **OK** to close the dialog box.

Exporting and Importing a Mapping

After creating a mapping, you can export it from Integration Composer to a text file to use as a backup or to access it from another location. You can view the contents of the exported file using a text editor, such as Microsoft Notepad, but do not edit the file in a text editor. Editing the file might corrupt it. You can also import an exported file into another instance of Integration Composer at a different location.

By default, Integration Composer stores exported files in the following location:

```
<installDir>\data\mappings
```

Exporting a Mapping

To export a mapping, complete the following steps:

1. From the Select Action menu in the Integration Composer Mapping window, select **Export**. Integration Composer displays the Export Mapping dialog box.

2. In the **File name** field in the Export Mapping dialog box, enter a file name for the mapping.

3. Click **Save**. Integration Composer exports the mapping to the specified location. If Integration Composer successfully exports the file, it displays a confirmation message.

4. In the confirmation message dialog box, click **OK**.

Importing a Mapping

From the Integration Composer Mapping window, you can import a mapping into Integration Composer.

WARNING Importing a mapping has the following effect on the original mapping:

- If an expression exists in both mappings, Integration Composer replaces the existing expression with the imported expression.
- Integration Composer adds any new expressions in the imported mapping to the original mapping.
- If an expression exists only in the original mapping, it remains unchanged; Integration Composer does not delete the existing expression.

If a mapping expression exists for a target class or target property that does not exist in the target schema, you will not get any warning or errors when you import the mapping. However, when you execute the mapping, you will get errors.

To import a mapping into Integration Composer, complete the following steps:

1. From the Select Action menu in the Integration Composer Mapping window, select **Import**. Integration Composer displays the Import Mapping dialog box.

2. In the Import Mapping dialog box, double-click to select a file to import. Optional: You can use the browse features in this window to locate a file.

   NOTE The .fsn extension identifies Integration Composer mapping files.

3. Click **Open**. Integration Composer imports the mapping.

   NOTE If any errors result from importing the mapping, Integration Composer displays a dialog box listing the errors and asking if you want to continue to import the mapping. To respond, select one of the following options:

   - To cancel the import action without importing the mapping, click **No**. Integration Composer closes the dialog box and does not import the mapping.

To continue to import the mapping, click **Yes**. Integration Composer imports the mapping and displays errors in red. Resolve the errors before saving the mapping.

4 Optional: You can modify the mapping.

5 When you finish the mapping, from the Select Action menu, select **Save** to save the mapping. Integration Composer saves the mapping.

NOTE To save changes as a new mapping, from the Select Action menu, select **Save As**. Integration Composer displays a Save Mapping As window. In the **Mapping Name** field in this window, type a new name for the mapping and click **OK**. Integration Composer saves the changes with the new mapping name. For instance, if you open mapping A and save it as B, Integration Composer saves the changes as mapping B and keeps mapping B open for editing. Mapping A will still exist in its original form.

6 To close the Mapping window, from the Select Action menu, select **Close**. Integration Composer displays a Close Mapping dialog box.

7 In the Close Mapping dialog box, click **Yes**. Integration Composer closes the Mapping window and displays the IBM Integration Composer window.

Deleting a Mapping

Occasionally, you no longer need a mapping. The following procedure explains how to delete a mapping permanently. If you delete a mapping, Integration Composer also deletes its last scan history.

WARNING After you delete a mapping, you must recreate it if you subsequently want to use it. If you think you might want to use a mapping again, but you do not want to keep it in Integration Composer, you can export the mapping to a file and then import it back into Integration Composer if necessary. For information about exporting and importing mappings, see “Exporting and Importing a Mapping” on page 47.

To delete a mapping, complete the following steps:

1 Close any open windows using the desired mapping.

2 In the IBM Integration Composer window, select **Delete Mapping**. Integration Composer displays the Select Mapping(s) to Delete Permanently window.

3 In the Select Data Schema(s) to Delete Permanently window, select one or more mappings to delete by clicking the mapping.

- To select a series of mappings, use **Shift+Click**.
- To select separate mappings, use **Ctrl+Click**.
- To select all mappings in the list, click **Select All**.

- To cancel the selection of all mappings in the list, click **Deselect All**.

4 After you select one or more mappings, click **Delete**. Integration Composer displays a Delete Mapping confirmation dialog box.

5 On the Delete Mapping dialog box, select one of the following options:

- To delete one or more mappings, click **Yes**. Integration Composer deletes the selected mappings and displays the IBM Integration Composer window.
- To keep this mapping, click **No**. Integration Composer closes the Delete Mapping confirmation dialog box and displays the IBM Integration Composer window.
- To cancel deletion of the selected mapping and select a different mapping to delete, click **Cancel**. Integration Composer closes the Delete Mapping confirmation dialog box and displays the Select Mapping(s) to Delete Permanently window so that you can select a different mapping to delete.

Deleting Mapping Last Scan History

When Integration Composer executes a mapping for the first time, it copies the last scan date for top-level objects in the *source* data source into the Integration Composer repository. On subsequent mapping executions, Integration Composer compares the last scan date in the Integration Composer repository with the scan date in the *source* data source and performs one of the following actions:

- If the date for an object in the source is earlier than or is the same as the last scan date in the repository, Integration Composer skips the source instance.
- If the date for an object in the source occurs after the last scan date in the repository, Integration Composer processes the expressions for the source instance and updates the last scan date in the repository.

By doing this, Integration Composer ensures that it transfers **only the data that has changed** since the last scan date.

If you modify a mapping and you want to implement the change, you might want **all** data transferred. To accomplish this, you must delete the last scan history.

To delete the last scan date, complete the following steps:

1 In the IBM Integration Composer window, choose **Delete Mapping Last Scan History**. Integration Composer displays the Select Last Scan History(s) to Delete window.

2 In the Select Last Scan History(s) to Delete window, select one or more mappings for which you want to delete the last scan history by clicking the mapping.

- To select a series of mappings, use **Shift+Click**.
- To select separate mappings, use **Ctrl+Click**.

- To select all mappings in the list, click **Select All**.
- To cancel the selection of all mappings in the list, click Deselect All.

3 After selecting one or more mappings, click **Delete**. Integration Composer displays a Delete Mapping Last Scan History confirmation dialog box.

4 In the Delete Mapping Last Scan History dialog box, select one of the following options:

- To delete the scan history, click **Yes**. Integration Composer deletes the selected scan history or histories and displays the IBM Integration Composer window.
- To keep this scan history, click **No**. Integration Composer closes the Delete Mapping Last Scan History confirmation dialog box and displays the IBM Integration Composer window.
- To cancel deletion of the selected scan history and select a different scan history to delete, click **Cancel**. Integration Composer closes the Delete Mapping Last Scan History confirmation dialog box and displays the Select Last Scan History(s) to Delete window so that you can select a different scan history to delete.

Executing a Mapping

When you create a mapping, you define a set of expressions that specify how to transform instances of data from a source to a target. To transform the data and import it from the source into a target, you must execute the mapping. For information about how Integration Composer processes expressions during the mapping execution process, see "Mapping Execution" on page 36.

You execute mappings from a command line interface. To execute a mapping, you run the script that is located in the bin subdirectory of the Integration Composer installation directory. For Microsoft Windows operating systems, the file is executeMapping.bat. For UNIX-based operating systems the file is executeMapping.sh.

The executeMapping.bat and executeMapping.sh files require that you set parameters for the mapping. Define the following parameters when executing a mapping:

- Deleting last scan history (optional)

  Setting this parameter is optional. By default, when importing data, Integration Composer processes only the data that has changed since the last scan date. However, if you modify a mapping and you want to implement the change, you might want all data processed. To accomplish this, you must delete the last scan history. Set the **-delete** parameter only if you want *all* data processed when you execute the mapping.

  NOTE You can also choose to delete the last scan history using the Delete Mapping Last Scan History option in the Integration Composer user interface before you execute the mapping. For more information about deleting the last scan history, see “Deleting Mapping Last Scan History” on page 50.

- Mapping execution specifications

  You must specify mapping name, repository user name and password, source user name and password, and target user name and password for mapping execution.

  There are three options for defining these parameters.

  - You can use an editor such as Notepad to open the executeMapping.bat or executeMapping.sh file, specify the parameters, and then execute the file. If you have more than one mapping to execute, you can edit the file and save separate files for each mapping that you want to execute.

  - You can provide parameter arguments directly after the executeMapping command line.

  - You can use a command line that invokes the executeMapping.properties file to run the mapping. You must select this option if you want to encrypt passwords.

Using Schedulers

You can use a scheduling program, such as Windows scheduler, to execute mappings. If you use a scheduler, you must comment out the line containing the ‘pause’ command at the end of the file. To comment out a line, add REM at the beginning of the line, as shown in the following example.

Example

```
:exit
@echo Integration Composer has finished pause
```

becomes

```
:exit
@echo Integration Composer has finished REM pause
```

Command Line Conventions

When specifying parameters for a command line, use the following conventions:

- If any of the parameter arguments contain spaces, enclose the parameter argument in double quotation marks.

- If any of the parameter arguments do not have a value, enter single quotation marks without a space in between. For example, if you do not have a password for a database, enter single quotation marks for this parameter argument, as shown in the following example:

```
set TARGETPWD=”
```

Executing Mappings with an Edited File

To execute a mapping using an edited file, you must edit the script file in a text editor and then execute it from a command line.

There are two sections of the script file that you can edit for mapping execution:

- Check for delete last scan history flag

  This section includes the following parameter:

  ```
  set DELETE=
  if not {%1} == {-delete} goto setPropFile set DELETE=%1
  shift
  ```

  You can edit this section to delete the last scan history.

- Check the command line options

  This section includes the following parameter arguments that let you specify which mapping to execute and connection parameters for Integration Composer, the source, and the target:

Command Line Parameter Options

Parameter	Description
set MAPPINGNAME=%1	Name of the mapping to execute, for example “TADDM to DPA.”
set REPOSITORYUSER=%2	Login name for the Integration Composer repository, for example maximoid.
set REPOSITORYPWD=%3	Password for the Integration Composer repository, for example maximopw.
set SOURCEUSER=%4	Login name for the source data source, for example, sourceid.
set SOURCEPWD=%5	Password for the source data source, for example, sourcepw.
set TARGETUSER=%6	Login name for the target data source, for example, maximoid.
set TARGETPWD=%7	Password for the target data source, for example, maximopw.

Editing the Script File

To edit the command line file, complete the following steps:

1 Open any text editor, such as MS Notepad.

2 Navigate to the <installDir>\bin> directory, and open the **executeMapping.bat** file (Windows environments) or **executeMapping.sh** file (UNIX environments).

3 Optional: To delete the last scan history before executing the mapping, in the Check for Delete Last Scan History Flag section, modify the following parameter from:

```
set DELETE=
```

to

```
set DELETE=-delete
```

as shown in the following example:

Example

```
set DELETE=-delete
if not {%1} == {-delete} goto setPropFile set DELETE=%1
shift
```

4 To configure the file for mapping execution, in the ":setMappingParams" section, specify mapping name, repository user name and password, source user name and password, and target user name and password for mapping execution, as shown in the following example:

Example

```
set MAPPINGNAME="TADDM to DPA"
set REPOSITORYUSER=maximoid
set REPOSITORYPWD=maximopw
set SOURCEUSER=sourceid
set SOURCEPWD=sourcepw set
TARGETUSER=maximoid set
TARGETPWD=maximopw
```

5 Save the modified file and close the editor.

Executing the Script File

To execute a script file, complete the following steps:

1 If Integration Composer is open, close the application.

2 Open a command prompt.

3 Navigate to the bin subdirectory in your Integration Composer installation directory.

<installDir>\bin\

4 Type the appropriate command:

executeMapping.bat (for Microsoft Windows installations)

or

./executeMapping.sh (for UNIX installations)

5 Press **Enter**.

Executing Mappings with an executeMapping.properties File

You can delete the last scan history and execute the mapping by invoking the parameters specified in the executeMapping.properties file. You must use this option if you want to encrypt passwords in the mapping.

To execute a mapping with the properties file, complete the following steps:

1. If Integration Composer is open, close the application.
2. Create an executeMapping.properties file with the parameters required for your mapping. For more information about this creating this file, see “Mapping Encryption” on page 38.
3. Open a command prompt.
4. Navigate to the bin subdirectory in your Integration Composer installation directory.

   <installDir>\bin\

5. Select the appropriate option for your environment:

   - For Microsoft Windows installations:

     - To delete last scan history and then execute the mapping:

       ```
       executeMapping.bat -delete -f <filename>
       ```

       Example

       ```
       executeMapping.bat -delete -f
       “Integration Composer\bin\executeMapping1.properties”
       ```

     - To execute the mapping without deleting last scan history:

       ```
       executeMapping.bat -f <filename>
       ```

       Example

       ```
       executeMapping.bat -f “Integration Composer\bin\executeMapping1.properties”
       ```

   - For UNIX installations, select the appropriate option:

     - To delete last scan history and then execute the mapping:

       ```
       ./executeMapping.sh -delete -f <fully qualified file name including file path>
       ```

       Example

       ```
       ./executeMapping.sh -delete -f “Integration_Composer/bin/
       executeMapping1.properties”
       ```

     - To execute the mapping without deleting last scan history:

       ```
       ./executeMapping.sh -f <fully qualified file name including file path>
       ```

Example

```
./executeMapping.sh -f “Integration_Composer/bin/executeMapping1.properties”
```

6 Press **Enter**.

7 When the mapping is completed, press **Enter** again.

Executing Mappings Directly from a Command Line

You can delete the last scan history and execute the mapping directly from a command line.

To execute a mapping from a command line, complete the following steps:

1 If Integration Composer is open, close the application.

2 Open a command prompt.

3 Navigate to the bin subdirectory in your Integration Composer installation directory.

<installDir>\bin\

4 Select the appropriate option for your environment:

- For Microsoft Windows installations:
  - To delete last scan history and then execute the mapping:

    ```
    executeMapping.bat -delete mappingName repositoryUserName repositoryPassword
    sourceUserName sourcePassword targetUserName targetPassword
    ```

    Example

    ```
    executeMapping.bat -delete "TADDM to DPA" maximoid maximopw
    sourceid sourcepw maximoid maximopw
    ```

  - To execute the mapping without deleting last scan history:

    ```
    executeMapping.bat mappingName repositoryUserName
    repositoryPassword sourceUserName sourcePassword
    targetUserName targetPassword
    ```

    Example

    ```
    executeMapping.bat "TADDM to DPA" maximoid maximopw sourceid
    sourcepw maximoid maximopw
    ```

- For UNIX installations, select the appropriate option:
  - To delete last scan history and then execute the mapping:

```
./executeMapping.sh -delete mappingName repositoryUserName repositoryPassword
sourceUserName sourcePassword targetUserName targetPassword
```

Example

```
./executeMapping.sh -delete "TADDM to DPA" maximoid maximopw
sourceid sourcepw maximoid maximopw
```

- To execute the mapping without deleting last scan history:

  ```
  ./executeMapping.sh mappingName repositoryUserName
  repositoryPassword sourceUserName sourcePassword
  targetUserName targetPassword
  ```

  Example

  ```
  ./executeMapping.sh "TADDM to DPA" maximoid maximopw sourceid
  sourcepw maximoid maximopw
  ```

5. Press **Enter**.
6. When the mapping is completed, press **Enter** again.

Creating Effective Mappings

This section of this chapter offers useful information for special mapping expressions and suggestions for creating effective mappings in Integration Composer.

Unique Identifiers for Deployed Asset Data

Naming and Reconciliation Service is an optional component implemented with Integration Composer that you can use to uniquely identify deployed assets and to avoid duplication of asset records in your database. By default, Integration Composer is configured to use this component, which assigns a globally unique identifier, the NRS GUID, to a deployed asset based on defined naming rules. For more information about implementation of this component, see Appendix D – *Naming and Reconciliation Service (NRS)*.

Mapping Key Properties

When creating a mapping, if a class has only a generated value or a foreign key, you must select one or more properties as alternate keys for the class.

Mapping Data for Units of Measurement

In some cases, source data uses one unit of measurement for a property and the target uses a different unit of measurement. For example, the unit of measurement in the source might be kilobytes, and the unit of measurement in the target might be megabytes. In such cases, you have to create a mapping expression to transform the units of measurement.

For example, if the value for a property, such as RAM (random access memory) in the source is expressed in kilobytes and the target uses megabytes, you must define an expression in your mapping to convert from kilobytes to megabytes, as shown in the following example.

```
'RAM.Size(bytes)'/ 1024.
```

When Integration Composer imports data, it performs the appropriate calculation to compensate for the difference.

Mapping Data for Sites and Organizations

Most discovery tools do not provide scanned data about sites and organizations. If you want to differentiate data by sites and organizations, you must specifically set these values in the Integration Composer mapping.

If you want to include site or organization data, you can insert literal values for the Siteid and Orgid properties in the mapping target.

Site and organization data is not a requirement, but you can specify a value for site and organization so that the data is available in the target. Because Integration Composer does not validate this data, be sure to specify a valid value.

NOTE For IBM Control Desk users: The IBM Control Desk Deployed Assets module applications have a **Site** field but not an organization field. The organization can be determined based on the site. If the Deployed Assets module applications display site information, the standard rules govern how site data is displayed.

Mapping Data for Deployed Asset Conversion Applications

NOTE This section applies only to IBM Control Desk users who import data into Deployed Assets module applications.

Because of variable hardware and software naming conventions, data collected by discovery tools for display in the Deployed Assets module is often inconsistent. For example, operating system might sometimes be Fermion 4 and sometimes Fermion IV. In addition, sometimes discovery tools include version and release numbers in product names, such as Office 4.1 or Office 5.2. An enterprise might only want to track instances of Office without specifying a version number.

The Deployed Assets Administration module in IBM Control Desk includes the following five conversion applications that let administrators configure the products to translate inconsistent names used by discovery tools to standard naming conventions.

- Adapter Conversion – translates adapter names, both media adapters (such as video and sound cards) and network adapters.
- Manufacturer Conversion – translates manufacturer names.
- Operating System Conversion – translates operating system names.
- Processor Conversion – translates processor (CPU) names.

The conversion applications in the Deployed Assets Administration module let administrators review the names assigned to imported data and, if necessary, set up conversions that translate variations in adapter, operating system, processor , or manufacturer names to a standard naming convention.

Each record in a conversion application specifies a target name and a variant or a set of variants. A variant is a variation of a name that is translated to the target name each time data is displayed.

IBM Control Desk apply deployed asset conversions each time deployed asset data for computers, network devices, and network printers is requested. The translated data is displayed in the Deployed Assets module applications and is used in the reports generated for these products.

When Integration Composer imports adapter, manufacturer, processor, and operating system data, it checks the data to determine whether the name used for the deployed asset data exists as a variant on a conversion record. If Integration Composer does not find a variant, it creates a conversion record with a target name and a variant name that are identical to the name used for the deployed asset data.

To enable Integration Composer to supply a target name and variant, an Integration Composer mapping must contain expressions for both a target name and a variant name for adapters, manufacturers, processors, operating systems and software applications. The target name must be identical to the variant name.

You cannot have a null value for the target name and variant name properties. If these properties have null values, no deployed asset data is displayed for computers, network printers, network devices, adapters, manufacturers, operating systems, processors, or software.

In Integration Composer adapter mappings, the expression defined for both the target name and the variant name searches for a value and, if the value is null, returns the string “UNKNOWN” as shown in the following example:

```
{
   String name = 'OS.ManufacturerName';
   if ((name != null) && (name.length() > 0))
   {
      if (!"<dummy text>".equalsIgnoreCase(name) &&
            !"unknown".equalsIgnoreCase(name))
      {
           return name;
      }
   }

     return "UNKNOWN";
}
```

Mapping Data for Files

NOTE This section applies only to IBM Control Desk users who import data into Deployed Assets module applications.

You should be aware that mapping source data about files to the Deployed Assets **File** class might affect Integration Composer performance if large numbers of files are present. Integration Composer adapters do **not** map source data about files. You can modify adapter mappings to include file data. However, you should be aware that this might negatively affect Integration Composer performance.

5 Creating Data Schemas

A data schema is a structure for organizing and classifying data in a database. Integration Composer provides default data schemas and also lets users define their own data schemas. This chapter explains how to work with user-defined data schemas. It explains how to create new data schemas, open existing data schemas, import data schemas, export data schemas, and delete schemas.

Understanding Integration Composer Data Schemas

A data schema defines both data contents and relationships. Integration Composer interprets data and transforms it to the format required for the IBM Control Desk database based on the structures defined in data schemas.

When installed, Integration Composer provides the following data schemas:

- data schemas required for commonly used discovery tools
- data schemas for the most frequently used target, the Deployed Assets tables in the IBM Control Desk database.
- data schemas to use for the IT asset initialization process, which lets you create a baseline set of IT assets when you first implement IT asset management:

The Integration Composer repository contains metadata that defines the structure of the data for these data schemas. You can browse these data schemas, and you can use them to create mappings.

Integration Composer lets you define additional data schemas using the data schema definition features described in this chapter. You can use the data schema features to create data schemas, modify any data schemas you create through Integration Composer, export data schemas, import data schemas, and delete data schemas. The Integration Composer repository stores metadata for user-defined data schemas.

For more information about classes and properties in Integration Composer data schemas, see "Introduction to Data Schemas," on page 13.

Creating Data Schemas

The following procedure explains how to create a new data schema. You use the following two windows to create a data schema:

- Define a New Data Schema window
- Data Schema window

Define a New Data Schema Window

Integration Composer displays the Define a New Data Schema window when you select **Define New Data Schema** in the IBM Integration Composer window.

In this window, you name the data schema, specify a data source for the data schema, and specify the parameters for connecting to the data source. A data schema definition includes connection parameters you define for a specific data source so that you can easily open it when you want to work with it again. After you define data source connection parameters, Integration Composer stores the connection information and displays those parameters when you attempt to connect to the data source. The only parameter that Integration Composer requests is the password.

The Define a New Data Schema window displays the following pages:

- **Data Schema –** You use this page to specify a name for the data schema.

- **Data Source –** You use this page to specify a data source name for the data schema.

- **Connection Information –** You use this page to select a connection method and connection parameters for the data schema. The connection parameter fields displayed depend upon the type of driver selected.

The Define a New Data Schema window includes the following buttons:

Button	**Description**
Back	Returns to the previous page in the window.
Next	Advances to the next page in the window.
Finish	Completes the data schema definition.
Cancel	Cancels the data schema definition.
Test Connection	Lets you test the connection before you create the data schema.

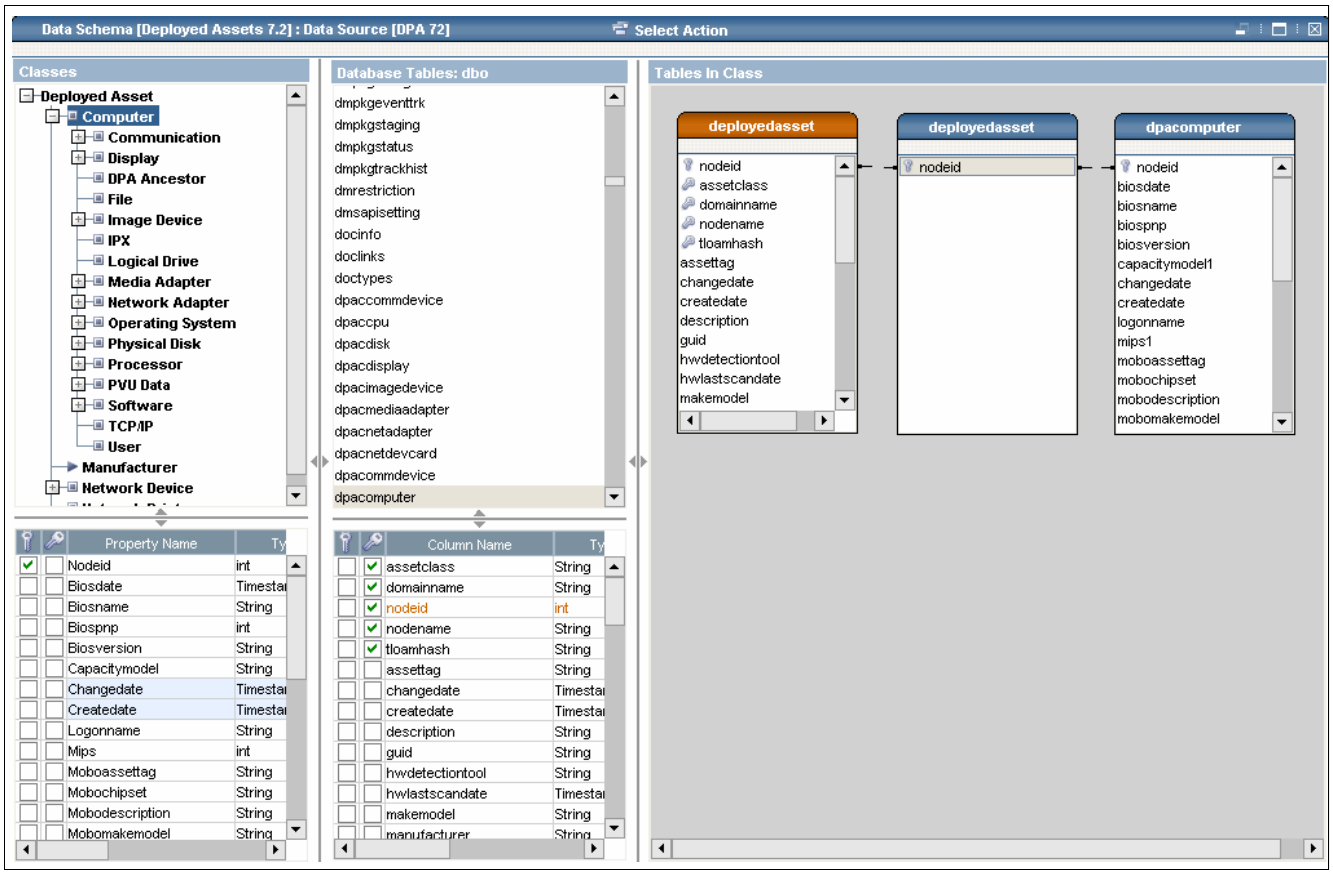
Data Schema Window

Integration Composer displays the Data Schema window when you click **Finish** on the Connection Information page of the Define a New Data Schema window or Open Existing Data Schema window. The Data Schema window lets you define classes and properties for a data schema. It displays classes that you create and their properties, database tables and columns, and a graphical representation of the relationships between the database tables.

The Data Schema window consists of three sections, as shown in the following figure:

- Classes
- Database Tables
- Tables in Class

Data Schema Window



Data Schema [Deployed Assets 7.2] : Data Source [DPA 72]   Select Action

Classes

- Deployed Asset
  - Computer
    - Communication
    - Display
    - DPA Ancestor
    - File
    - Image Device
    - IPX
    - Logical Drive
    - Media Adapter
    - Network Adapter
    - Operating System
    - Physical Disk
    - Processor
    - PVU Data
    - Software
    - TCP/IP
    - User
  - Manufacturer
  - Network Device

		Property Name	Ty
✓		Nodeid	int
		Biosdate	Timesta
		Biosname	String
		Biospnp	int
		Biosversion	String
		Capacitymodel	String
		Changedate	Timesta
		Createdate	Timesta
		Logonname	String
		Mips	int
		Moboassettag	String
		Mobochipset	String
		Mobodescription	String
		Mobomakemodel	String

Database Tables: dbo

dmpkgeventtrk
dmpkgstaging
dmpkgstatus
dmpkgtrackhist
dmrestriction
dmsapisetting
docinfo
doclinks
doctypes
dpaccommdevice
dpaccpu
dpacdisk
dpacdisplay
dpacimagedevice
dpacmediaadapter
dpacnetadapter
dpacnetdevcard
dpacommdevice
dpacomputer

		Column Name	Ty
	✓	assetclass	String
	✓	domainname	String
	✓	nodeid	int
	✓	nodename	String
	✓	tloamhash	String
		assettag	String
		changedate	Timesta
		createdate	Timesta
		description	String
		guid	String
		hwdetectiontool	String
		hwlastscandate	Timesta
		makemodel	String
		manufacturer	String

Tables In Class

deployedasset: nodeid, assetclass, domainname, nodename, tloamhash, assettag, changedate, createdate, description, guid, hwdetectiontool, hwlastscandate, makemodel

deployedasset: nodeid

dpacomputer: nodeid, biosdate, biosname, biospnp, biosversion, capacitymodel1, changedate, createdate, logonname, mips1, moboassettag, mobochipset, mobodescription, mobomakemodel

Classes Section

The Classes section consists of two panes. The top pane displays a hierarchical tree view of the classes that you create in the data schema. Integration Composer displays classes (including the root class) in red if no properties are associated with the class or if the class has no link to a parent class. The lower pane displays properties of the class selected in the top pane.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

Classes Tree Action Menu

The Classes tree view provides an action menu. Integration Composer displays this menu when you right-click a class in the tree view.

The following table lists the actions available in the menu.

Action	Function
Add...	Opens a New Class window to let you add a new class to the data schema.
Rename	Opens a text field to let you rename a class in the data
schema. Delete	Deletes the selected class from the data schema.
Paste	Pastes tables or selected columns that you copied in the Database Tables section of the window.
Properties	Opens a Class Properties window to let you view or edit attributes of a class.

Class Properties Table

The lower pane in the Classes section displays a table, which lists the properties for the class selected in the top pane. In the Data Schema Window figure on page 63, **Computer** is the selected class, and the table in the lower half of the window displays the properties of that class.

The following table lists the data displayed for each class property in the class properties table.

Column	Description
🔑	Check box to specify whether the property is a primary key. If the check box is selected, the property is a primary key. If the check box is cleared, the property is not a primary key.
🔑	Check box to specify whether the property is an alternate key. If the check box is selected, the property is an alternate key. If the check box is cleared, the property is not an alternate key.
Property Name	Name of the property.
Type	Java data type for the property.
Size	Size of the property. If you double click this cell in the table, Integration Composer opens a spin box to let you select a value for size. The lowest value available is 1. Integration Composer determines the upper limit based on the limit specified for the associated database table column.
Null	Check box to specify whether the property can be null. If the check box is selected, Integration Composer can use null values for the property. If the check box is cleared, Integration Composer requires a value for the property. If the corresponding database table column is required (that is, it is defined as not null), then the property is also defined as not null, and you cannot change it.
Show	Check box that specifies whether Integration Composer displays the property.
Table Name	Name of the database table for the property.
Table Column	Name of the database column for the

property.

Class Properties Action Menu

The properties table in the Classes section provides an action menu. Integration Composer displays this menu when you right-click a property in the table.

The following table lists the actions available in the menu.

Action	Function
Rename	Opens the text field to let you rename the selected
property. Delete	Deletes the selected property from the data schema.
Paste	Pastes tables or selected columns that you copied in the Database Tables section of the window.
Generate d Value	Opens a Generated Value dialog box to let you associate a class property with a predefined Java method that generates a value when you execute a mapping.

Database Tables Section

The Database Tables section of the Data Schema window displays tables and columns that you can use for classes and properties in the data schema. You cannot edit data in the Database Tables section of the Data Schema window.

The Database Tables section consists of two panes. The top pane displays database tables, views, and aliases available for the table owner specified when you connected to the data source. The lower pane displays columns associated with the table or tables selected in the upper pane. The rows in the lower pane are color coded. Rows displayed in orange text are the columns selected for class properties; rows in black text are columns that are not selected for class properties.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

The following table lists the data displayed in each row in the lower half of the Database Tables section.

Column	Description
🔑	Check box to specify whether the column is a primary key. If the check box is selected, the column is a primary key. If the check box is cleared, the column is not a primary key.
🔑	Check box to specify whether the column is an alternate key. If the check box is selected, the column is an alternate key. If the check box is cleared, the column is not an alternate key.
Column Name	Name of the column in the database table.
Type	Java data type for the column.
Size	Size of the column.
Null	Check box to specify whether the column can be null. If the check box is selected, Integration Composer can use null values for the column. If the check box is cleared, Integration Composer cannot use null values for the column.

Column	Description
Table Name	Name of the database table where the column is located.

Tables in Class Section

The Tables in Class section of the Data Schema window consists of a single pane that displays a box for each database table associated with the class selected in the Classes tree view. The title of the box is the database table name. The title bars are color coded. Integration Composer displays tables for parent classes with an orange title bar. It displays tables for child classes with a blue title bar. Inside each box, Integration Composer lists the columns that you selected from the database table for the class properties.

Link Relationships

In the Tables in Class section, you can create link relationships to join tables. You can create relationships between parent and child or sibling tables by linking primary keys and alternate keys.

For each link relationship, Integration Composer displays a line connecting the columns in the tables. Lines are color coded. When you select a link, it becomes active, and Integration Composer displays it in blue. Integration Composer displays a black line for inactive links that are not selected. You can double-click the line to view the link properties. You can right-click the line to open a menu that allows you to either view link properties or delete the link, as shown in the following figure.

Integration Composer connects linked tables that belong to a parent class with an orange line. You cannot modify these links. Integration Composer displays them for information only.

NOTE You can also select the line linking two columns and press the **Delete** key to delete the link or press **Enter** to view the link properties.

Select Action Menu

The title bar of the Data Schema window contains a Select Action menu with the following options.

Menu Option	Description
Close	Closes the data schema. If you made any changes that you did not save, prompts you to save the changes.
Save	Saves the data schema.
Export Data Schema	Opens an Export Data Schema dialog box to let you export the data schema.
Import Data Schema	Opens an Import Data Schema dialog box to let you import a data schema. This feature is active only when you create a new data schema in Integration Composer.
Auto-Arrange	Rearranges the database tables displayed in the Tables in Class section on the Data Schema window.

Menu Option	Description
Properties	Opens the Data Schema Properties window to let you set properties for classes you use for caching, hardware last scan date, software last scan date, and time stamp.

Working with Classes and Tables in the Data Schema Window

In the Data Schema window, you can create classes for the data schema, add properties and child classes to a class, define link relationships, import data schemas, export data schemas, save and close data schemas. The Data Schema window includes several action menus and drag-and-drop features that let you define and work with the data schema.

Drag-and-Drop Features

On the Data Schema window, you can use the drag-and-drop feature to perform the following actions:

- Move an entire database table from the upper half of the Database Tables section to a selected class in the tree view in the Classes section. This creates a property in the class for each column in the database table.
- Move selected database columns (that is, rows) from the lower half of the Database Tables section to a selected class in the tree view in the Classes section. This creates a class property for the column.
- Rearrange tables displayed in the Tables in Class section.
- Create a link between two columns in the tables displayed in the Tables in Class section.

When you select a class and add columns from one or more tables as properties for the class, Integration Composer performs the following actions:

- In the Classes section, Integration Composer adds the property or properties to the lower half of the section.
- In the Database Tables section, as you add properties to a class, Integration Composer highlights all tables selected in the top half of the section and accumulates rows for all columns in the selected tables in the lower half of the section. The rows in the lower pane are color coded. Rows displayed in orange text are the columns that you selected for class properties; rows in black text are columns you did not select for class properties.
- In the Tables in Class section, Integration Composer displays a box for each table selected. In this box, Integration Composer lists columns selected for class properties.

Creating a New Data Schema

In general, use the following sequence of operations to create a data schema:

1. Select the **Define New Data Schema** function in Integration Composer to name the data schema, specify a data source name, and specify connection parameters to the data source.

2. In the Data Schema window, which Integration Composer displays after you define a new data schema, select classes and properties for the data schema. Before you can save a data schema, you must add properties to each class. You must also designate primary or alternate keys or both primary and alternate keys for the class.

3. Save the data schema.

After you save and close a data schema, you can use the **Browse Data Source by Structure** option in the IBM Integration Composer window to open the data schema and verify that you created it properly.

Guidelines for Creating Data Schemas

Use the following guidelines for creating data schemas.

- For each class that you create, you must define properties, and you **must** designate at least one primary key (PK) property. If appropriate, you can also create alternate keys. Integration Composer does not let you save a data schema if a class has no properties or key(s).

- In most cases, you can look at the unique indexes for a table to determine what alternate keys to use.

- You can add more than one table to the same class if necessary.

Defining a Data Schema

You use the following procedure to define a new data schema. You perform this action in the Define a New Data Schema window. Integration Composer displays this window when you select **Define New Data Schema** in the IBM Integration Composer window.

When you define a data schema, you name the data schema, associate it with a data source, and specify connection parameters for the data source. After you define data source connection parameters, Integration Composer stores the connection information and displays those parameters when you attempt to connect to the data source. The only parameter Integration Composer requests is the password.

After you use the following procedure to define a new data schema, Integration Composer displays the Data Schema window, and you can define classes and properties for the data schema.

To define a new data schema, complete the following steps:

1 In the IBM Integration Composer window, choose **Define New Data Schema**. Integration Composer displays the Data Schema page of the Define a New Data Schema window.

NOTE In the Define a New Data Source window, you can click **Back** to review or change previous selections. To cancel this procedure and return to the IBM Integration Composer window, click **Cancel**.

Naming the Data Schema

2 In the **Data Schema** field on the Data Schema page, enter the name of the data schema, then click **Next**. Integration Composer displays the Data Source page. Data Schema names are case sensitive; for example, Deployed Assets is different from DEPLOYED ASSETS.

Defining the Data Source

3 In the **Data Source** field, enter a name for the data source (the name must have at least two characters), then click **Next**. Integration Composer displays the Connection Information page. Data Source names are also case sensitive.

If you enter the name of an existing data source, Integration Composer displays a dialog box informing you that the data source already exists and asking if you want to overwrite it. To overwrite the existing data source, click **Yes**. Click **No** if you do not want to overwrite the existing data source. Integration Composer closes the dialog box, and you can enter a different data source name on the Data Source page.

Setting Up Connection Parameters

4 On the Connection Information page, in the **Connection Method** field, select a connection method.

5 Enter the parameters for the connection method as required. The fields displayed depend upon the type of driver selected. The following table lists some of the fields that Integration Composer might display.

Field	Description
Host Name	Host name for a data source. For the Configuration Discovery and Tracking API, the host name of the server on which the IBM Configuration Discovery and Tracking Server is installed.
Host Port	Port for the data source.
Host SID	Session identifier for the host (that is, the database instance name).
Database	Database name for the data source.
User Name	Database user name for the data source. For the Configuration Discovery and Tracking API, the user identifier to access IBM Configuration Discovery and Tracking.
Password	Database password for the data source. For the Configuration Discovery and Tracking API, the password associated with the user login account.

Field	Description
Table Owner	Database schema name or database schema owner.
Trusted Location	Fully-qualified path of the SSL certificate file to use to connect to a server such as the Configuration Discovery and Tracking server. For example, c:\Integration Composer\...\jssecacerts.cert
Use SSL	Check box that specifies whether the connection is an SSL (Secure Socket Layer) connection. If you select this check box, you must enter a value in the Trusted Location field.
URL	URL address to access a database instance or server, such as the Configuration Discovery and Tracking server.

6 Optional: If you have installed Integration Composer in Arabic or Hebrew and want to define bidirectional layout formats for the database that you are connecting to, click **Bidi Layout Format**. For information about how to specify bidirectional layout formats, see “Defining Bidirectional Data Normalization” on page 182.

7 Optional: To test the connection to the data source, click **Test Connection**. Integration Composer displays a Test Connection dialog box. The text in the dialog box depends on whether the test was successful. To respond to the dialog box, select one of the following options:

- If Integration Composer cannot establish a connection, it displays an explanatory message. Click **OK**. Integration Composer closes the Test Connection dialog box. Review the values for the connection parameters and retry the connection.

- If Integration Composer establishes a connection, it displays a confirmation message. Click **OK**. Integration Composer closes the Test Connection dialog box.

NOTE The Test Connection feature lets you test only the connection without invoking any additional Integration Composer processes.

8 On the Connection Information page, click **Finish**. Integration Composer displays the Data Schema window. When you create a new data schema, Integration Composer displays the root class in red because no properties are associated with the class.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

9 You can now rename the root class, add the root class properties, add other classes and properties, and create relationships between classes. For more information about adding classes, properties, and relationships, refer to the following procedures:

- “Renaming the Root Class” on page 71.

- “Adding a Class” on page 72.

- “Adding Properties to a Class” on page 74.
- “Adding a Reference Class” on page 79.
- “Adding a Relationship” on page 78.
- “Adding a Child Class” on page 77.
- “Designating a Primary Key” on page 80.
- “Designating an Alternate Key” on page 81.

10 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

NOTE If Integration Composer does not save the data schema successfully, it displays an error message. Click **OK**. Resolve the errors and try to save the data schema again.

11 Optional: To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Renaming the Root Class

Creating the root class is the first step in setting up a new data schema. You create a root class in the Data Schema window.

After you select Define a New Data Schema in the IBM Integration Composer window, name the data schema, associate it a data source, and specify connection information, Integration Composer displays the Data Schema window. In this window, in the Classes section, Integration Composer displays a place holder for the root class, **New Root Class**, in red text.

To rename the root class, complete the following steps:

1 To name the root class, in the Classes section, right click **New Root Class**. Integration Composer displays an action menu.

2 From the action menu, select **Rename**. Integration Composer displays a Class Properties dialog box for the root class.

3 In the Class Properties dialog box, rename the root class and click **OK**. Integration Composer renames the class and displays the new name for the root class in the Data Schema window. Integration Composer displays the new name in red because you have not added properties to the class.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

4 Add properties and child classes to the root class as required. For more information about adding classes, properties, and relationships, refer to the following procedures:

- “Adding a Class” on page 72.

- “Adding Properties to a Class” on page 74.
- “Adding a Reference Class” on page 79.
- “Adding a Relationship” on page 78.
- “Adding a Child Class” on page 77.
- “Designating a Primary Key” on page 80.
- “Designating an Alternate Key” on page 81.

5 Optional: You can continue to add classes, properties, keys, and links; or you can change elements of the data schema.

6 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

NOTE If Integration Composer does not save the data schema successfully, it displays an error message. Click **OK**. Resolve the errors and try to save the data schema again.

7 Optional: To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Adding a Class

You use this procedure to add a new class to a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

Before you can add classes to a data schema, you must create a new data schema or open an existing data schema. The following instructions assume that you have created or opened a data schema and that Integration Composer displays the Data Schema window.

When you add a class, you cannot save the data schema until you perform the following steps:

1 Add properties to the class.

2 Designate a primary key for the class.

3 Link the new class to its parent class with one or more primary key or alternate key properties.

To add a new class to a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, right-click the class to which you want to add a new class (in some cases, this might be the root class). Integration Composer displays an action menu.

3 From the action menu, select **Add**. Integration Composer displays the New Class window.

The following table describes the fields in the New Class window.

Field	Description
Name	Specifies the name of the new class.
Parent	Displays the parent to which you will add the new class. You cannot edit this field.
Reference	Specifies whether the new class is a reference class. By default, the check box is empty, and the new class belongs to a parent-child relationship. Select the check box if you want to create a reference class. After you click **OK** and the window closes, you cannot modify this field.
Same As	This field becomes active if you select the **Reference** check box. You can use this field to choose an existing reference class to add to the parent class. Using an existing reference class improves caching performance.
Displayable	Specifies whether Integration Composer displays the new class when you browse a data source or a data schema (that is, using the Browse Data Source by Structure or Browse Data Source by Data functions). By default, Integration Composer selects this check box. Clear the check box if you do not want the class to display when browsing the data schema.

The following buttons are available on the New Class window.

Button	Description
OK	Adds the class to the data schema and closes the New Class window.
Cancel	Cancels the action without creating a new class.

4 In the **Name** field in the New Class window, type the name of the new class.

NOTE In some cases you might want to add a reference class. For instructions about adding reference classes, see "Adding a Reference Class" on page 79.

5 Optional: Clear the **Displayable** field. If you clear this field, Integration Composer does not display this class when you browse the data schema using the **Browse Data Source by Structure** or **Browse Data Source by Data** options in the IBM Integration Composer window.

6 In the New Class window, click **OK**. Integration Composer adds the new class to the selected class in the Classes section of the Data Schema window.

Integration Composer displays the class name in red, indicating that no properties have been added to the new class.

7 Add properties, keys, and relationships to the class as required. For more information about working with classes, see the following procedures:

- “Adding Properties to a Class” on page 74.
- “Adding a Reference Class” on page 79.
- “Adding a Relationship” on page 78.
- “Adding a Child Class” on page 77.
- “Designating a Primary Key” on page 80.
- “Designating an Alternate Key” on page 81.

8 After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

NOTE If Integration Composer does not save the data schema successfully, it displays an error message. Click **OK**. Resolve the errors and try to save the data schema again.

9 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Adding Properties to a Class

You use this procedure to add one or more properties to a class in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

Integration Composer offers the following two ways to add properties to a class:

- You can add all columns of a selected database table as class properties.
- You can select specific columns in the database table to add as properties of a class.

The following instructions assume that you have created or opened a data schema and that Integration Composer displays the Data Schema window.

After you create or open a data schema, you create properties in a class by using the cursor to drag a database table or selected columns in a table to the class where you want to add the properties.

To add a property to a class in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.

- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Data Schema window, select the class to which you want to add properties.

3 To add properties to the class, select one of the following options:

- To add **all** columns from one or more database tables as properties of the class:

  a In the upper half of the Database Tables section of the Data Schema window, click the database table you want to use for properties in the class. Integration Composer displays the columns in this database table in the lower half of the Database Tables section. If appropriate, you can select more than one table.

  - To select a series of tables, use **Shift+Click.**

  - To select separate tables, use **Ctrl+Click**.

  As you select tables, Integration Composer highlights each table selected in the top half of the section and accumulates rows for all columns in the selected tables in the lower half of the section. Integration Composer displays rows in the lower pane in black text to indicate that the columns are not properties for the class.

  b When you have selected all the appropriate tables, click one of the selected database tables a second time and drag the cursor to the class in the Classes tree view where you want to add the properties. When you release the mouse device, Integration Composer adds all columns for the selected table or tables as properties of the selected class and displays these properties in the lower half of the Classes section.

  In the Database Tables section, in the upper pane, Integration Composer highlights all tables associated with the class in brown. In the lower pane, Integration Composer displays rows used for properties in orange text to indicate that the columns are selected as properties for the class.

  In the Tables in Class section, Integration Composer displays a box for the table or tables selected. In this box, Integration Composer lists each column selected for a class property. Integration Composer displays table boxes for parent classes with an orange title bar. It displays table boxes for child classes with a blue title bar.

  NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

- To add **selected** columns from one or more database tables as properties of the class:

a In the upper half of the Database Tables section of the Data Schema window, click the database table you want to use for properties in the class. If appropriate, you can select more than one table.

- To select a series of tables, use **Shift+Click.**
- To select separate tables, use **Ctrl+Click**.

As you select tables, Integration Composer highlights each table selected in the top half of the section and accumulates rows for all columns in the selected tables in the lower half of the section. Integration Composer displays rows in the lower pane in black text to indicate that the columns are not properties for the class.

b In the lower half of the Database Tables section, click one or more rows to select the column or columns that you want to use for a class property.

- To select a series of columns, use **Shift+Click.**
- To select separate columns, use **Ctrl+Click**.

c When you have selected all the appropriate rows, click one of the selected rows, drag the cursor to the class in the Classes tree view where you want to add the properties, and release the mouse-device. Integration Composer adds the selected columns as properties of the selected class and displays the properties in the lower half of the Classes section.

In the Database Tables section, in the upper pane, Integration Composer highlights all tables associated with the class in brown. In the lower pane, Integration Composer displays rows used for properties in orange text to indicate that the columns are selected as properties for the class.

In the Tables in Class section, Integration Composer displays a box for the table or tables selected. In this box, Integration Composer lists each column selected for a class property. Integration Composer displays table boxes for parent classes with an orange title bar. It displays table boxes for child classes with a blue title bar.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

4 Optional: To change properties listed in the properties table of the Classes section, select from the following options:

- For information about adding key properties, see “Designating a Primary Key” on page 80. Also see “Designating an Alternate Key” on page 81.
- For information about creating relationships, see “Adding a Relationship” on page 78.
- For information about renaming a property, see “Renaming a Class Property” on page 98.

- To specify whether a property can contain a null value, scroll to the Null column in the lower pane of the Classes section and select one of the following options:

  - To let Integration Composer use null values for this property, select the **Null** check box.

  - To prevent Integration Composer from using null values for this property, clear the **Null** check box.

- To specify whether Integration Composer displays the property when you browse a data source, scroll to the Show column in the lower pane of the Classes section and select one of the following options:

  - To specify that Integration Composer displays the property, select the **Show** check box.

  - To specify that Integration Composer does not display this property, clear the **Show** check box.

5 After you finish adding properties, from the Select Action menu on the Data Schema window, select **Save**. Integration Composer saves the data schema.

6 Optional: To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Adding a Child Class

You use this procedure to add a child class to a parent or root class in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

Before you can add classes to a data schema, you must create a new data schema or open an existing data schema.

To add a child class to a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.

- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, right-click the class to which you want to add a child class (in some cases, this might be the root class). Integration Composer displays a select action menu.

3 From the action menu, select **Add**. Integration Composer displays the New Class window.

4 In the **Name** field in the New Class window, type the name of the new class.

NOTE In some cases you might want to add a reference class. For instructions about adding reference classes, see “Adding a Reference Class” on page 79.

5 Optional: Clear the **Displayable** field. If you clear this field, Integration Composer does not display this class when you browse the data schema using the Browse Data Source by Structure or Browse Data Source by Data options in the IBM Integration Composer window.

6 Click **OK**. Integration Composer adds the new class to the selected class in the Classes section. Integration Composer displays the class name in red, indicating that no properties have been added to the new class.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

7 Add properties, keys, and links to the class as required. For more information about working with classes, see the following procedures:

- “Adding Properties to a Class” on page 74.
- “Adding a Reference Class” on page 79.
- “Adding a Relationship” on page 78.
- “Designating a Primary Key” on page 80.
- “Designating an Alternate Key” on page 81.

8 After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

9 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Adding a Relationship

You use the following procedure to add a link relationship between two tables in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

The system translates the table joins you create with a link to a SQL inner join when retrieving instances from the database. Integration Composer does not support other types of joins, such as SQL outer joins.

Before you can create a relationship between two tables in a data schema, you must create a new data schema or open an existing data schema.

To create a link relationship between two tables in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema and add classes to it or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2. In the Classes tree view in the upper left corner of the Data Schema window, select the class for which you want to create a link relationship (in some cases, this might be the root class). Integration Composer displays the tables associated with the selected class in the Tables in Class section of the window.

3. In the Tables in Class section of the window, in the first of the two tables you want to link, select the column you want to link. Integration Composer highlights the selected column in brown.

   NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

4. Click the same column you selected in step 3 a second time, drag the cursor to the table and column you want to link to, then release the mouse device. Integration Composer creates the link and displays a line linking the two columns.

5. After you finish adding the necessary link relationships, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

6. Optional: To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Adding a Reference Class

You use this procedure to add a reference class to a parent or root class in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

A reference class cannot be created under another reference class.

Before you can add a reference class to a data schema, you must create a new data schema or open an existing data schema.

To add a reference class to a data schema, complete the following steps:

1. In Integration Composer, either create a new data schema and add classes to it or open an existing data schema.

   - For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
   - For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2. In the Classes tree view in the upper left corner of the Data Schema window, right-click the class to which you want to add a reference class (in some cases, this might be the root class). Integration Composer displays a select action menu.

3 From the action menu, select **Add**. Integration Composer displays the New Class window.

4 To add a reference class, select the **Reference** check box and choose one of the following options:

- To use an existing reference class, from the **Same As** drop-down list, select a reference class. Integration Composer populates the **Name** field with the name of the reference class selected.

- To create a new reference class, complete the following steps:

  a From the **Same As** drop-down list, select the blank item in the list.

  b In the **Name** field, type the name of the new reference class.

5 Optional: Clear the **Displayable** check box. By default, Integration Composer selects the check box. If you clear this field, Integration Composer does not display this class when you browse the data schema using the Browse Data Source by Structure or Browse Data Source by Data options in the IBM Integration Composer window.

6 Click **OK**. Integration Composer adds the reference class to the selected class in the Classes section. Integration Composer displays the class name in red, indicating that no properties have been added to the new class. In the Classes tree view, Integration Composer displays an arrow next to the class to indicate that this is a reference class.

7 Add properties, keys, and links to the class as required.

- For more information about adding properties to the class, see “Adding Properties to a Class” on page 74.

- For more information about designating a primary key for the class, see “Designating a Primary Key” on page 80.

8 After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

9 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Designating a Primary Key

You use this procedure to designate a property as a primary key for a class in a data schema that you create in Integration Composer. A primary key is a property or set of properties that uniquely identifies each instance of its class. You perform this action in the Data Schema window.

Before you can designate a primary key for a class in a data schema, you must create a new data schema or open an existing data schema. You must also add the class and add properties to the class.

To add a primary key to a class in a data schema, complete the following steps:

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 Optional: Add a class and add properties to the class.

- For more information about adding classes, see “Adding a Class” on page 72.
- For more information about adding properties to a class, see “Adding Properties to a Class” on page 74.

3 In the Classes tree view in the upper left corner of the Data Schema window, select the class for which you want to designate a primary key. Integration Composer displays the properties associated with the selected class in the lower half of the Classes section of the window.

4 To designate a primary key, in the Primary Key column in the properties table, select the check box for the property you want to be the primary key. Integration Composer highlights the selected property and designates it as a primary key.

5 You can continue to add properties, keys, and links to the class as required. For more information about creating relationships, see “Adding a Relationship” on page 78.

6 After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

7 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Designating an Alternate Key

You use this procedure to designate a property as an alternate key for a class in a data schema that you create in Integration Composer. An alternate key is a property or set of properties that is an **equivalent** way to identify an instance. The combination of the alternate key values must be unique **within the class**. If you use a generated value for a primary key, Integration Composer requires an alternate key.

You perform this action in the Data Schema window.

Before you can designate an alternate key for a class in a data schema, you must create a new data schema or open an existing data schema. You must also add the class and add properties to the class.

You can use database table indexes for alternate keys.

To add an alternate key to a class in a data schema, complete the following steps:

1. In Integration Composer, either create a new data schema or open an existing data schema.
   - For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
   - For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.
2. Optional: Add the class to which you will add the alternate key and add properties to the class.
   - For more information about adding classes, see “Adding a Class” on page 72.
   - For more information about adding properties to a class, see “Adding Properties to a Class” on page 74.
3. In the Classes tree view in the upper left corner of the Data Schema window, select the class for which you want to designate an alternate key. Integration Composer displays the properties associated with the selected class in the lower half of the Classes section of the window.
4. To designate an alternate key, in the Alternate Key column in the properties table, select the check box for the property you want to be the alternate key. Integration Composer highlights the selected property.
5. You can continue to add properties, keys, and links to the class as required.
6. After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.
7. To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Defining a Generated Value Property

A generated value property is a property whose value Integration Composer generates automatically when you execute a mapping for the target data source.

NOTE Defining a property as a generated value is meaningful only for target data schemas. When you execute mappings, Integration Composer ignores generated value properties in the source data source.

You use the following procedure to define a generated value for a property of a class in a data schema that you create in Integration Composer. Before you can define a generated value for a class property in a data schema, you must create a new data schema or open an existing data schema. You must also add the class and add properties to the class.

To define a generated value for a property in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 Optional: Add a class and add properties to the class.

- For more information about adding classes, see “Adding a Class” on page 72.
- For more information about adding properties to a class, see “Adding Properties to a Class” on page 74.

3 In the Classes tree view in the upper left corner of the Data Schema window, select the class for which you want to define a generated value property. Integration Composer displays the properties associated with the selected class in the lower half of the Classes section of the window.

4 In the lower pane of the Classes section of the Data Schema window, right-click the property for which you want to define a generated value. Integration Composer displays a select action menu.

5 From the action menu, select **Generated Value**. Integration Composer displays the Generated Value dialog box.

The following table describes the fields in the Generated Value dialog box.

Field	Description
Java Package	Specifies the Java package for Integration Composer to use when generating a value. For example, com.mro.fusion.providerinterface
Java Class	Specifies the Java class for Integration Composer to use when generating a value. For example, DeployedAssetsUtils
Java Method	Specifies the Java method to use when generating a value. For example, getNextId

6 In the Generated Value dialog box, select **Generated Value**. Integration Composer makes the **Java Package**, **Java Class**, and **Java Method** fields active.

7 In the **Java Package** field, type a Java package. For example,

com.mro.fusion.providerinterface

8 In the **Java Class** field, type a Java class. For example,

DeployedAssetsUtils

9 In the **Java Method** field, type a Java method. For example,

```
getNextId
```

10 In the Generated Value window, click **OK**. Integration Composer saves the generated value property and closes the Generated Value dialog box. Integration Composer displays the generated value property highlighted in blue.

11 Optional: You can continue to add properties, keys, and links to the class.

12 After you finish adding the necessary properties, keys, and links to the class, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

13 To close the data schema, from the Select Action menu, select Close. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Defining Data Schema Properties

Integration Composer lets you specify a class and a property in which store the following data for a data schema: cache, hardware last scan date, software last scan date, and time stamp. You set up these properties in the Data Schema Properties window, which Integration Composer displays when you select **Properties** from the Data Schema window's Select Action menu.

To define data schema properties, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 From the Select Action menu in the Data Schema window, select **Properties**. Integration Composer displays the Data Schema Properties window.

The window includes the following fields:

Field	Description
Name	Name of the data schema. You cannot edit this field.
Cache: **Class Name** **Property Name**	Specifies the cache holder class and property name. In general, the cache class is the root class, and the cache properties are the primary keys of the root class.
Hardware Last Scan: **Class Name** **Property Name**	Specifies which class and property store the hardware last scan date.

Field	Description
Software Last Scan: **Class Name** **Property Name**	Specifies which class and property store the software last scan date.
[redacted]	Specifies how to decipher the software and [redacted] used as a target data schema.

The Data Schema Properties window includes the following buttons:

Button	Description
OK	Adds the data you entered to the data schema and closes the Data Schema Properties window.
Cancel	Cancels the action.
Select	Opens a Class Properties dialog box to let you select one or more class properties for the data schema's cache holder class.
Legend	Opens the Time Stamp Format Legend dialog box. In this dialog box, Integration Composer displays formats you can use when entering a value in the **Time-Stamp Format** field in the Data Schema Properties window. Click **OK** to close the dialog box.
?	Displays Help information about the selected area of the Data Schema Properties window.

3 In the **Class Name** field in the Cache section of the window, use the drop- down list to select a value for the class name.

4 In the **Property Name** field in the Cache section, click **Select**. Integration Composer displays a Class Properties dialog box.

5 In the Class Properties dialog box, select one or more class properties. To select class properties, select one of the following options:

- To select a series of properties, use **Shift+Click**.
- To select separate items, use **Ctrl+Click**.
- To select the entire list, click **Select All**.

NOTE To clear the choices, click **Deselect All**. To exit this function without selecting a class property, click **Cancel**. Integration Composer displays the Data Schema Properties window.

6 After you select one or more class properties, click **OK**. Integration Composer closes the Class Properties dialog box and displays the class properties selected in the **Property Name** field in the Data Schema Properties window.

7 In the Hardware Last Scan section of the Data Schema Properties window, use the drop-down lists to select values for the **Class Name** and **Property Name** fields.

8 In the Software Last Scan section of the window, use the drop-down lists to select values for the **Class Name** and **Property Name** fields.

9 In the Time Stamp section of the window, enter a value or use the drop-down list to select a value for the **Time-Stamp Format** field.

NOTE If you want to enter a value, you can use a value listed in the Time Stamp Format Legend dialog box. To display this dialog box, click **Legend**.

10 After you finish defining data schema properties, click **OK**. Integration Composer closes the Data Schema Properties dialog box.

11 You can continue to work with the data schema. After you finish the data schema, from the Select Action menu on the Data Schema window, select **Save**. Integration Composer saves the data schema.

NOTE If Integration Composer does not save the data schema successfully, it displays an error message. Click **OK**. Resolve the errors and try to save the data schema again.

12 To close the Data Schema window, from the Select Action menu, select **Close**. Integration Composer closes the data schema.

Changing an Existing Data Schema

After you create and save data schemas, you can open them and change them as needed. This section of the *Administrator Guide* explains how to open an existing data schema and make the following changes:

- Change attributes of a class
- Change properties in a class
- Delete a class
- Delete a class property
- Delete a relationship
- Rename a class
- Rename a class property

Opening an Existing Data Schema

After creating and saving a new data schema, you can open an existing data schema to view or edit classes or properties in the data schema.

If the data source for the data schema that you select is not currently open, you must specify data source connection information before Integration Composer opens the data schema. In an Integration Composer session, when you create a data source for the first time, you must define JDBC setup information on the Connection Information page of the Define a New Data Schema window. When you open a data source on subsequent occasions, Integration Composer displays the previous database connection information as the default, and you must enter a password.

When you open an existing data schema, if discrepancies exist between the data source and the data schema, Integration Composer displays the Data Schema Analysis window. This window lists discrepancies that Integration Composer found between the data schema and the corresponding data source. You can use this window to correct the following discrepancies:

- Case of a table name in the database does not match that of a table associated with a class in the data schema.
- Case of a column name in the database does not match that of a table column associated with a class table in the data schema.
- Length of a table column in the database does not match length of the same column in the data schema.
- Data type of a table column in the database does not match that of the same column in the data schema.
- If tables or columns exist in the data schema that are not in the database, and if Integration Composer can safely remove them, it will mark those errors as repairable; otherwise it will mark the errors as non-reparable.

To open an existing data schema, complete the following steps:

1. In the IBM Integration Composer window, choose **Open Existing Data Schema**. Integration Composer displays the Open an Existing Data Schema window.

   The page displays data schemas installed with Integration Composer and data schemas that you created using the **Define a New Data Schema** function.

2. On the Data Schema page in the Open an Existing Data Schema window, select the desired data schema and click **Next**. Integration Composer displays the Data Source page of the window, which lists data sources available for the selected data schema.

3. On the Data Source page of the Open an Existing Data Schema window, select a data source for the data schema and click **Next**. Integration Composer displays one of the following windows:

   - Data Schema Analysis window

- Data Schema window
- Connection Information page in the Open an Existing Data Schema window (if the data source for the specified data schema is not open)

4 Select one of the following options:

- If Integration Composer displays the Data Schema Analysis window, go to step 5 on page 88.
- If Integration Composer displays the Data Schema window, go to step 7 on page 89.
- If Integration Composer displays the Connection Information page on the Open an Existing Data Schema window, use the following procedure to complete the connection information:

  a On the Connection Information page, either accept the settings established for the last connection to the source data source or update the fields and enter a password.

  b Optional: To test the connection to the data source, click **Test Connection**. Integration Composer displays a Test Connection dialog box. The text in the dialog box depends on whether or not the test was successful. To respond to the message dialog box, select one of the following options:

  - If Integration Composer cannot establish a connection, it displays an explanatory message. Click **OK**. Integration Composer closes the dialog box. Review the values for the connection parameters and retry the connection.
  - If Integration Composer establishes a connection, it displays a confirmation message. Click **OK**. Integration Composer closes the dialog box.

  c Optional: If you have installed Integration Composer in Arabic or Hebrew and want to define bidirectional layout formats for the database that you are connecting to, click **Bidi Layout Format**. For information about how to specify bidirectional layout formats, see “Defining Bidirectional Data Normalization” on page 167.

  d On the Connection Information page in the Open an Existing Data Schema window, click **Finish**. Integration Composer displays either the Data Schema Analysis window or the Data Schema window.

  - If Integration Composer displays the Data Schema Analysis window, go to step 5 on page 88.
  - If Integration Composer displays the Data Schema window, go to step 7 on page 89.

5 If discrepancies exist between the data source and the data schema, Integration Composer displays the Data Schema Analysis window.

The Data Schema Analysis window includes the following buttons:

Button	Description
Statistics	Opens a Data Schema Statistics window that displays statistics for table and column errors.
Expand All	Expands all nodes in the tree to display information about inconsistencies between the data schema and the data source.
Synchronize	Fixes any discrepancies that Integration Composer can correct automatically. Those discrepancies are marked with a green check. **NOTE** You cannot clear the check boxes. You can either synchronize all discrepancies indicated or none at all.
Close	Closes the Data Schema Analysis window.

6 Review the discrepancies displayed in the Data Schema Analysis window and select one of the following options:

- To fix discrepancies, click **Synchronize**. Integration Composer fixes the discrepancies that it can repair and displays the Data Schema window.

- To close the dialog box without synchronizing, click **Close**. Integration Composer displays a Data Schema Analysis warning window.

  Select one of the following options:

  - To make the data schema match the source database, in the Data Schema Analysis warning window, click **Yes**. Integration Composer synchronizes the data, closes the warning window, closes the Data Schema Analysis window, and displays the Data Schema window. Go to step 7.

  - To leave the data schema as is, click **No**. Integration Composer imports the data schema as is and displays the Data Schema window. Go to step 7.

    NOTE You can save the data schema without synchronizing the data. However, you will not be able to execute mappings that have this data schema until you have fixed the discrepancies between the data source and the data schema. Before executing mappings, re-open the data schema and fix the discrepancies.

  - To cancel the action, click **Cancel**. Integration Composer closes the warning window and displays the Data Schema Analysis window. Review the options in this window and select the appropriate action. These options are described in step 5.

7 In the Data Schema window, you can add new classes, properties, and relationships to the data schema; delete classes, properties, and relationships; or change classes, properties, and relationships. For more information about working with the data schema, see the following procedures:

- “Adding a Class” on page 72.

- “Adding Properties to a Class” on page 74.
- “Adding a Reference Class” on page 79.
- “Adding a Relationship” on page 78.
- “Adding a Child Class” on page 77.
- “Designating a Primary Key” on page 80.
- “Designating an Alternate Key” on page 81.
- “Changing Class Attributes” on page 90.
- “Changing Properties in a Class” on page 96.
- “Renaming a Class” on page 97.
- “Renaming a Class Property” on page 98.
- “Deleting a Class” on page 99.
- “Deleting a Class Property” on page 100.
- “Deleting a Relationship” on page 101.

8. After you finish working with the data schema, from the Select Action menu, select **Save** to save the data schema. Integration Composer saves the data schema.

9. To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the Data Schema window and displays the IBM Integration Composer window.

Changing Class Attributes

You use this procedure to change attributes of a class that you create in an Integration Composer data schema. You perform this action in the Data Schema window.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To change attributes of a class in a data schema, complete the following steps:

1. In Integration Composer, either create a new data schema or open an existing data schema.

    - For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
    - For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2. In the Classes tree view in the upper left corner of the Data Schema window, right-click the class you want to change. Integration Composer displays the

properties associated with the selected class in the lower half of the Classes section of the window and opens a select action menu.

3 From the select action menu, select **Properties**. Integration Composer displays the Class Properties window.

The Class Properties window includes the following fields:

Field	Description
Name	Specifies the name of the class.
Parent	Displays the parent of the class.
Reference	This check box specifies whether or not the selected class is a reference class. After you click **OK** and the Class Properties window closes, you cannot modify this field.
Same As	You cannot edit this field.
Displayable	Specifies whether Integration Composer displays the class when you browse a data source by data or by structure (that is, using the **Browse Data Source by Structure** or **Browse Data Source by Data** functions). By default, this check box is selected. Clear the check box if you do not want the class to display when browsing the data schema.

The following buttons are available on the Class Properties window.

Button	Description
OK	Changes the class attributes and closes the Class Properties Class window.
Cancel	Cancels the action without saving the class attributes.
Advanced	Opens the Advanced Class Properties window to let you define additional criteria for selecting class instances.

4 Optional: In the Class Properties window, you can make the following changes:

- To change the class name, delete the name in the **Name** field and enter a new class name.
- To change the setting in the **Displayable** check box, you can clear the check box or select the check box.
- To enter a statement to filter the class data that you retrieve, click **Advanced**. Integration Composer displays the Advanced Class Properties window. For more information about filtering class data, see “Filtering Class Data” on page 92.

5 When you finish changing the class attributes, click **OK**. Integration Composer closes the Class Properties window and saves the changes.

6 Optional: You can change properties in the class or add classes, keys or links to the class. For more information about changing a class, refer to the following procedures:

- "Adding a Class" on page 72.
- "Adding Properties to a Class" on page 74.
- "Adding a Reference Class" on page 79.
- "Adding a Relationship" on page 78.
- "Adding a Child Class" on page 77.
- "Designating a Primary Key" on page 80.
- "Designating an Alternate Key" on page 81.
- "Changing Properties in a Class" on page 96.
- "Renaming a Class" on page 97.
- "Renaming a Class Property" on page 98.
- "Deleting a Class" on page 99.
- "Deleting a Class Property" on page 100.
- "Deleting a Relationship" on page 101.

7 After you finish the changes, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

8 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Filtering Class Data

When you edit class attributes, Integration Composer lets you create statements that filter class data for the data schema.

You can use this feature to retrieve a subset of data for processing.

Example

You can define criteria that allow you to retrieve only source data that has been modified since the last mapping execution. When creating an SQL statement to filter a class, you can use the following variables for the begin and end time of the last mapping run:

- %LASTRUN_BEGIN%
- %LASTRUN_END%

For example, to retrieve only records in the source database that have been created since the last mapping run time, enter the following statement on the Table Criteria tab:

```
create_time > %LASTRUN_BEGIN%
```

This variable will be substituted for the time stamp (java.sql.Timestamp) of the begin time of the last successful mapping run. If the mapping has never run, then the earliest available time stamp will be used, which is January 1, 1970, 00:00:00 GMT.

Remember to remove the table criteria if, at a later time, you want to process all records.

The following procedure explains how to create one or more statements to filter class data.

To filter class data in a data schema, complete the following steps:

1. In the Classes tree view in the upper left corner of the Data Schema window, right-click the class you want to change. Integration Composer displays the properties associated with the selected class in the lower half of the Classes section of the window and opens a select action menu.

2. From the select action menu, select **Properties**. Integration Composer displays the Class Properties window.

3. In the Class Properties window, click **Advanced**. Integration Composer displays the Advanced Class Properties window.

   The Advanced Class Properties window has the following tabs:

   - Table Criteria
   - ORDER BY

   The following buttons are available on the Advanced Class Properties window.

Button	Description
OK	Saves the statement or statements that you enter and closes the Advanced Class Properties window.
Cancel	Cancels the action and closes the window.

Table Criteria Tab

On the Table Criteria tab, Integration Composer displays a list of tables associated with the selected class. You can use this window to define criteria for selecting class data for the data schema. In the Table Name column, Integration Composer displays the name of the table or tables associated with the class selected. In the Table Criteria column, it displays criteria you define for selecting class data.

The following buttons are available on the Table Criteria tab.

Button	Description
Edit	Opens an Edit Table Criteria window to let you define or edit additional WHERE clause conditions for the selected table in the form of an SQL statement.
Clear	Clears the contents of the Table Criteria column for the selected row in the table.

ORDER BY Tab

The ORDER BY tab specifies the sorting criteria for retrieving and displaying class instances. In the left column on this tab, Integration Composer displays the columns available for the table or tables associated with the selected class. You can move columns to the right pane to select them. You can also move the the columns up or down in the right pane to specify what order to use when sorting. Integration Composer then retrieves instances and displays them in the selected order.

Specifying sorting criteria on the Order By tab might negatively affect performance. Specify sorting criteria only when necessary.

The following buttons are available on the ORDER BY tab.

Button	Description
▶	Moves the selected column from the left pane to the right pane of the window.
◀	Moves the selected column from the right pane to the left pane of the window.
▲	Moves the selected column up in the list in the right pane of the window.
▼	Moves the selected column down in the list in the right pane of the window.

4 To filter class data retrieved, on Table Criteria tab in the Advanced Class Properties window, select the table you want to filter, and click **Edit**. Integration Composer displays the Edit Table Criteria window.

NOTE The statements that you enter on this tab are database-dependent. If you write a statement for an Oracle database, it might not work if you use the data schema for an IBM DB2 or Microsoft SQL Server database. If the table criteria specification includes a select statement, the statement should specify the table owner.

The Edit Table Criteria window includes the following fields:

Field	Description
Table Name	Specifies the name of the table selected.
Table Criteria	Text box in which to enter one or more statements that filter data for the table selected.

The following buttons are available on the Table Criteria tab.

Button	Description
Check Syntax	Checks the syntax of the statements. It is important to use this button to validate the statements because Integration Composer does not validate them when you click **OK**.
OK	Saves the statements that you enter and closes the Edit Table Criteria window.
Cancel	Cancels the action and closes the window.

5 In the Edit Table Criteria window, complete the following steps:

  a In the **Table Criteria** field, type one or more WHERE clause conditions to specify how to modify the search criteria when selecting instances for the current class. You must use the following format to specify tables and columns:

  <Table Name>.<Column Name>

  For example,

  SYSKST.GILTVON<=getDate()

  Do not type the word WHERE in the clause.

  b To check the syntax of the statement, click **Check Syntax**. Integration Composer displays either an Errors dialog box or a Check Syntax dialog box. Select one of the following options:

  - If Integration Composer reports errors, click **OK**. Review the statement, correct it, and click **Check Syntax** again.

  - If Integration Composer displays a Check Syntax dialog box that indicates there are no errors, click **OK**. Integration Composer displays the Edit Table Criteria window.

  c In the Edit Table Criteria window, click **OK**. Integration Composer displays the Advanced Class Properties window.

6 Optional: In the Advanced Class Properties window, select the ORDER BY tab to specify the order in which to sort instances when you bring them from the database, and complete the following steps:

  a From the list of available columns, select one or more columns and click ▶. Integration Composer moves the columns selected to the right pane.

  b Use the up and down buttons (▲, ▼) to move columns up or down in the list in the right pane. This determines the order in which Integration Composer displays class data.

7 When you have made all changes to the class properties, click **OK**. Integration Composer closes the Advanced Class Properties window and displays the Class Properties window.

8 In the Class Properties window, click **OK**. Integration Composer saves the class properties entered and displays the Data Schema window.

9 After you finish the changes, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

10 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Changing Properties in a Class

You use this procedure to change properties in a class in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

You can change class properties in the following ways:

- Change whether or not a property is a primary key.
- Change whether or not a property is an alternate key.
- Delete a class property. You can delete a property only if the corresponding database column is not required (that is, the **Null** check box for the database column is selected indicating that null values are allowed). It is possible to delete required class properties, but before you can do this, you must delete all the properties in the table. If any links to this table exist, they must also be deleted before you can delete all the properties of the table.

  NOTE If you import a data schema and choose not to repair the data schema when importing it, then find that there is a mismatch between the data schema and the database because the data schema contains a required property that no longer exists in the database, you can delete that property from the data schema without deleting all the properties.
- Rename a class property.
- Clear or select the **Null** check box. If a column in a database table allows null values, you can select or clear the **Null** check box for the related property in the data schema.
- Specify whether the property displays in Integration Composer when you browse a data source

To change a property in a class in a data schema, complete the following steps:

1. In Integration Composer, either create a new data schema or open an existing data schema.
   - For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
   - For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.
2. In the Classes tree view in the upper left corner of the Data Schema window, select the class with the properties you want to change. Integration Composer displays the properties associated with the selected class in the lower half of the Classes section of the window.
3. You can modify the class properties as required. To change class properties, select from the following options:
   - To specify whether the property can contain a null value, in the properties table in the lower half of the Classes window, scroll to the Null column and select one of the following options:

  - To let Integration Composer use null values for this property, select the **Null** check box.
  - To prevent Integration Composer from using null values for this property, clear the **Null** check box.

- To specify whether Integration Composer displays the property when you browse a data source, in the properties table in the lower half of the Classes window, scroll to the Show column and select one of the following options:

  - To specify that Integration Composer displays the property, select the **Show** check box.
  - To specify that Integration Composer does not display this property, clear the **Show** check box.

- For more information about designating a primary key for a class, see “Designating a Primary Key” on page 80.
- For more information about designating an alternate key for a class, see “Designating an Alternate Key” on page 81.
- For more information about deleting a class property, see “Deleting a Class Property” on page 100.
- For more information about renaming a class property, see “Renaming a Class Property” on page 98.

4 After you finish changing the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

5 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Renaming a Class

You use this procedure to rename a class in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To rename a class in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema and add classes to it or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, right-click the class that you want to rename. Integration Composer displays a select action menu.

3 From the action menu, select **Rename**. Integration Composer displays a Class Properties dialog box for the class.

4 In the Class Properties dialog box, rename the class and click **OK**. Integration Composer renames the class and displays the new name for the class in the Data Schema window.

5 Optional: You can continue to add classes, properties, keys, and links; or you can change elements of the data schema.

6 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

7 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Renaming a Class Property

You use this procedure to rename a property in a data schema class. You perform this action in the Data Schema window.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To rename a class property in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see "Defining a Data Schema" on page 68.
- For instructions on opening an existing data schema, see "Opening an Existing Data Schema" on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, select the class which has the property you want to rename. Integration Composer displays the properties for the selected class in the lower pane of the Classes section of the window.

3 In the lower pane of the Classes section of the window, right-click the property you want to rename. Integration Composer displays a select action menu.

4 From the action menu, select **Rename**. Integration Composer displays the selected class property name in a text box.

5 To rename the class property, select one of the following options:

- Backspace to the beginning of the text box and enter a new name for the class property.

- Select all the text in the text box and type a new name for the class property.

6 After you enter a new name, press **Enter**. Integration Composer renames the property.

7 Optional: You can continue to work with the data schema, adding classes, properties, keys, and links, or changing existing elements of the data schema.

8 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

9 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Deleting a Class

You use this procedure to delete a class from a data schema that you create in Integration Composer. You perform this action in the Data Schema window. You cannot delete a parent class associated with a child class unless you delete the child class first. If you attempt to delete a parent class that still has associated child classes, Integration Composer displays an error message.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To delete a class from a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.

- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, right-click the class that you want to delete. Integration Composer displays a select action menu.

3 From the action menu, select **Delete**. Integration Composer displays a Delete confirmation dialog box.

4 In the Delete confirmation dialog box, click **Yes**. Integration Composer deletes the selected class from the tree view.

5 Optional: You can continue to add classes, properties, keys, and links to the data schema.

6 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

7 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Deleting a Class Property

You use this procedure to delete a class property from a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

NOTE You can delete a property only if the corresponding database column is not required (that is, the **Null** check box for the database column is selected indicating that null values are allowed). It is possible to delete required class properties, but before you can do this, you must delete all the properties in the table. If any links to this table exist, they must also be deleted before you can delete all the properties of the table.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To delete a class property from a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, select the class which has the property you want to delete. Integration Composer displays the properties for the selected class in the lower pane of the Classes section of the window.

3 In the lower pane of the Classes section of the Data Schema window, right-click the property you want to delete. Integration Composer displays a select action menu.

4 From the action menu, select **Delete**. Integration Composer displays a Delete confirmation dialog box.

5 In the Delete confirmation dialog box, click **Yes**. Integration Composer deletes the selected property from the table in the lower pane of the Classes section. In the lower pane of the Database Tables section, Integration Composer displays the row for the deleted property in black indicating that the database column is no longer associated with a class in the data schema.

6 Optional: You can continue to add classes, properties, keys, and links to the data schema.

7 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

8 To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Deleting a Relationship

You use this procedure to delete a relationship between two database tables in a data schema that you create in Integration Composer. You perform this action in the Tables in Class section of the Data Schema window.

If you delete all links between a child and parent class tables, Integration Composer displays the class name in red to indicate that the selected class has no relationship to its parent.

The following instructions assume that you are working in a data schema with classes you created or that you have opened an existing data schema.

To delete a relationship between tables in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, select the class which has a relationship you want to delete. Integration Composer displays the database tables for the selected class in the Tables in Class section of the window. A link between tables is represented by a line connecting two columns in the tables.

3 To delete a link relationship, in the Tables in Class section of the window, select the link that you want to delete and choose one of the following options:

- Click the line for the link you want to delete and press the **Delete** key.
- Right-click the line for the link you want to delete. Integration Composer displays a select action menu. From the action menu, select **Delete**.

After you press the **Delete** key or select the **Delete** option, Integration Composer displays a Delete confirmation dialog box.

4 In the Delete confirmation dialog box, click **Yes**. Integration Composer deletes the selected link and no longer displays the line connecting the two database columns.

5 Optional: You can continue to add classes, properties, keys, and links or make changes to the data schema.

6 After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

Viewing Link Properties

You use this procedure to view properties of link relationships between two database tables in a data schema that you create in Integration Composer. You perform this action in the Data Schema window.

To view properties of a link relationship between tables in a data schema, complete the following steps:

1 In Integration Composer, either create a new data schema or open an existing data schema.

- For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
- For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2 In the Classes tree view in the upper left corner of the Data Schema window, select the class that has a relationship that you want to view. Integration Composer displays the database tables for the selected class in the Tables in Class section of the window. A link between tables is represented by a line connecting two columns in the tables.

3 To view link properties, in the Tables in Class section of the window, select one of the following options:

- Right-click the line for the link you want to view. Integration Composer displays a select action menu. From the action menu, select **Properties**.
- Double-click the line for the link you want to view.
- Select the link line and press **Enter**.

Integration Composer displays the Link Properties dialog box.

4 After you finish viewing link properties, click **OK**. Integration Composer closes the Link Properties dialog box.

5 You can continue to work with the data schema. After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

6 Optional: To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Deleting a Data Schema

If you no longer need a data schema, you can delete it from Integration Composer. You perform this action by selecting **Delete Data Schema** in the IBM Integration Composer window.

After you delete a data schema, you must recreate it if you subsequently want to use it. If you think you might want to use a data schema again, but you do not want to keep it in Integration Composer, you can export the data schema to a file and then import it back into Integration Composer. For more information about exporting data schemas, see “Exporting a Data Schema” on page 106. For more information about importing data schemas, see “Importing a Data Schema” on page 104.

Before you can delete a data schema, you must delete all data sources that you defined for the data schema. For more information about deleting a data source, see “Deleting a Data Source” on page 34.

To delete a data schema from Integration Composer, complete the following steps:

1. Close any open windows using the desired data schema.

2. In the IBM Integration Composer window, select **Delete Data Schema**. Integration Composer displays the Select Data Schema(s) to Delete Permanently window.

   This window displays data schemas created using Integration Composer and data schemas delivered with Integration Composer.

3. In the Select Data Schema(s) to Delete Permanently window, select one one or more data schemas to delete.

    - To select a series of data schemas, use **Shift+Click.**
    - To select separate data schemas, use **Ctrl+Click**.
    - To select all data schemas in the list, click **Select All**.
    - To cancel the selection of all data schemas in the list, click **Deselect All**.

4. After you select one or more data schemas, click **Delete**. Integration Composer displays a Delete Data Schema confirmation dialog box.

5. In the Delete Data Schema dialog box, select one of the following options:

    - To delete the data schema, click **Yes**. Integration Composer deletes the selected data schemas and displays the IBM Integration Composer window.
    - To keep this data schema, click **No**. Integration Composer closes the Delete Data Schema confirmation dialog box and displays the IBM Integration Composer window.
    - To cancel deletion of the selected data schema, click **Cancel**. Integration Composer closes the Delete Data Schema confirmation dialog box and

displays the Select Data Schema(s) to Delete Permanently window so that you can select a different data schema to delete.

Importing a Data Schema

You can create a data schema in Integration Composer by creating a new data schema and importing an existing data schema file (<file name>.schm). You perform this action from the Select Action menu in the Data Schema window.

If discrepancies exist between the data source and the data schema that you import, Integration Composer displays the Data Schema Analysis window. This window lists discrepancies that Integration Composer found between the data schema and the corresponding data source. You can use this window to correct the following discrepancies:

- Case of a table name in the database does not match that of a table associated with a class in the data schema.
- Case of a column name in the database does not match that of a table column associated with a class table in the data schema.
- Length of a table column in the database does not match length of the same column in the data schema.
- Data type of a table column in the database does not match that of the same column in the data schema.

To import a data schema into Integration Composer, complete the following steps:

1. In Integration Composer, create a new data schema. For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.
2. From the Select Action menu in the Data Schema window, select **Import Data Schema**. Integration Composer displays the Import Data Schema dialog box.
3. In the Import Data Schema dialog box, locate the file you want import, then select the file. Integration Composer populates the **File name** field with the file name.
4. Click **Open**. Integration Composer imports the data schema. If discrepancies exist between the data source and the data schema, Integration Composer displays the Data Schema Analysis window.

   For information about the buttons in this window, see page 89.
5. Review the errors displayed in the Data Schema Analysis window and select one of the following options:
   - To repair the errors, click **Synchronize**. Integration Composer repairs the errors and displays the Data Schema window.
   - To close the dialog box without repairing the errors, click **Close**. Integration Composer displays the Data Schema Analysis warning window:

Select one of the following options:

- To make the data schema match the source database, complete the following steps:

  a. In the Data Schema Analysis warning window, click **Yes**. Integration Composer repairs the errors, closes the warning window, closes the Data Schema Analysis window, and displays an Import confirmation dialog box indicating that the import is finished.

  b. In the Import dialog box, click **OK**. Integration Composer displays the Data Schema window. Go to step 6.

- To leave the data schema as is, click **No**. Integration Composer imports the data schema as is and displays the Data Schema window. Go to step 6.

- To cancel the action, click **Cancel**. Integration Composer closes the warning window and displays the Data Schema Analysis window. Review the options in this window and select the appropriate action. These options are described in step 5.

6. Optional: After you import the data schema file, you can modify it.

7. After you finish working with the data schema, from the Select Action menu, select **Save**. Integration Composer saves the data schema.

8. To close the data schema, from the Select Action menu, select **Close**. Integration Composer closes the data schema and displays the IBM Integration Composer window.

Exporting a Data Schema

After creating a data schema, you can export it from Integration Composer to a file to use as a backup or to access it from another location. You use the following procedure to export a data schema. You select this action from the Select Action menu in the Data Schema window. You can view the contents of the exported file using any text editor, such as Microsoft Notepad. You also can import the file into another instance of Integration Composer at a different location.

To export a data schema, complete the following steps:

1. In Integration Composer, either create a new data schema or open an existing data schema.

   - For instructions on creating a new data schema, see “Defining a Data Schema” on page 68.

   - For instructions on opening an existing data schema, see “Opening an Existing Data Schema” on page 87.

2. From the Select Action menu in the Data Schema window, select **Export Data Schema**. Integration Composer displays the Export Data Schema dialog box.

3. In the **File name** field in the Export Data Schema dialog box, enter a file name for the data schema.

4. Click **Save**. Integration Composer exports the data schema to the specified location.

6 Creating Expressions

A mapping is a set of expressions that tell Integration Composer how to transform source data when it is imported into the target database. For each data instance that you want to import from a source to a target, you define an expression that specifies how to transform the data for that property when it is migrated. Integration Composer uses Java programming language to convert data. Knowledge of this language is helpful for creating expressions, but it is not required.

NOTE Throughout this chapter, the term **source** refers to the source data source and the term **target** refers to the target data source.

Understanding Expressions

Integration Composer uses the expressions defined in a mapping to transform data instances when the data is migrated from a source to a target. Any information desired in the target must have an expression that defines how to transform the data in the source. However, expressions are not required for any class properties that will not be transferred from the source into the target.

When Expressions Are Required

Not every class and property requires an expression. Use the following guidelines when creating a mapping:

- If any property of the target class contains an expression, then all primary keys of the class must also contain an expression.
- If a property is a primary key for a class, the value of the primary key (or combination of the primary keys if there are more than one) must be unique.
- If a primary key is a generated value, some or all of the alternate keys must have expressions.
    - You do not have to create an expression for every alternate key property.
    - Integration Composer ignores alternate key properties without expressions.
- If all alternate key properties contain an expression, then the values that result from alternate key expressions must be unique.
- For every child or reference class that contains an expression, all primary keys in the parent class must contain an expression to ensure that no child or reference class instance is without a parent class instance.

- You do not have to create an expression for every required property. For numeric properties, Integration Composer does not require an expression. For Integers, Integration Composer inserts a default value of zero (0) into the target. For Double and Float, it inserts a default value of 0.0.

  Integration Composer highlights property rows that require a value with a yellow background.

  NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

  When you have a property row that cannot be null, you can create a target expression for instances where no data is available in the source, as illustrated in the following example:

```
{
    String str = trim ('Modem.Manufacturer'); if ((str!=null)
    && (str.length()>0))
          return str;

          return "UNKNOWN"
}
```

Syntax of Expressions

Expressions can be simple or complex. Simple expressions might take the form of a literal—that is, a value expressed in quotation marks that is inserted into the target as specified. For example, you can specify “MB” for the property Sizeunit to transform **Sizeunit** to **MB** in the target. You can also use a class and property name to create a simple expression; for example, you can use the expression **‘Adapter.AdapterType’** to insert the value of the property AdapterType from the class Adapter into the target.

To create more complex expressions, you can use predefined functions available in the Integration Composer user interface, or you can create complex expressions using Java programming language. In the following example, an Integration Composer function is used to change an integer into a string:

```
intToString ('Mouse.Mouse Port Name')
```

In the following example, Java programming instructions are used to replace a login name entered in upper case with the literal **default**, or if the login name is not in upper case, display the first eight characters:

```
{
     if
('Client.SysUserName'.equals('Client.SysUserName'.toUpperCase()
))
          return "default"; else
          return 'Client.SysUserName'.subString(0,7);
}
```

Creating Expressions

You create expressions in the Mapping window. For more information about the features available on this window, see “Mapping Window Features” on page 40. Integration Composer provides the following ways to create expressions:

- Drag and Drop
- Typing an expression in the **Expression** field
- **Deciding Class** drop-down list
- **Case Selection** field
- Expression Builder

Drag and Drop

You use the drag-and-drop feature to create an expression when the data in the source is transferred to the target field exactly as it is, and no transformation is required. Select the appropriate class in the source and in the target; then click the property in the source and drag the cursor to the property in the target. When you drag this property to the Expression cell in the target pane and release the mouse button, the class and property information populates the Expression column in the Target pane in the following form: ‘<class>.<property>’.

Typing an Expression

In the Mapping window, you can select a class and property on the Source pane. Then, on the Target pane, you can position the cursor in the **Expression** field for the desired property and class and double-click. Integration Composer opens a text input box in the **Expression** field. You can type an expression, such as a literal or a ‘<class>.<property>’, and press the **Enter** key. If there is an error in the expression, Integration Composer displays the expression in red text.

NOTE The display properties that you set for a computer might affect colors. The color displayed on the computer that you use might vary.

Selecting a Deciding Class

Sometimes you have to map more than one class in a source to a single class in the target. For example, suppose the target has a class Computer but the source has multiple classes for Computer, such as Client, BIOS, and RAM. When creating expressions, if you use multiple classes in the source to migrate data into a single class in the target, Integration Composer adds each class in the source to the list of values for the **Deciding Class** drop-down list in the Target pane.

You can select a deciding class from the drop-down list. Selecting a deciding class lets you control the number of instances Integration Composer creates in a target when more than one class in a source is mapped to a target class. Integration Composer creates target instances based on the number of instances of the deciding class that exist in the source.

For example, suppose information is mapped from the Client, BIOS, and RAM classes in the source to the Computer class in the target. Client is selected as the deciding class. When you execute the mapping, for every instance of Client that

exists in the source, Integration Composer creates an instance of Computer in the target.

If you map multiple properties in a source to a single class in the target but do not designate a deciding class, Integration Composer creates one instance in the target using the first instance in the source that meets the criteria. You must select a deciding class if you want multiple instances in the target.

In the following cases, you are not dealing with multiple instances. Consequently, it is **not** necessary to select a deciding class:

- You have mapped only one source class to a target class, or

- You have used a literal value in the **Expression** field, and you have not mapped any source classes to the target class. In this case, Integration Composer creates only one instance in the target for each parent class.

If you map to a literal and do not select a deciding class, Integration Composer creates an instance in the target whether or not there is an instance in the source. If you map to a literal and you do not want an instance in the target when there is no instance in the source, select a deciding class. Then Integration Composer does not create an instance in the target if no instance exists in the source.

If a class is the root class and therefore has no parent, then Integration Composer creates only one instance.

Setting Up Multiple Cases

You use the case selection feature when you need to migrate data from multiple classes in the source into multiple instances in a single target class. The case selection feature lets you create a set of expressions that apply on a case-by-case basis to the same target class.

For example, suppose in the target database you have the class Adapter, which will hold data from the following classes in the source: Sound Adapter and Video Adapter. In the target, you can create two cases for the class Adapter, one for the sound adapter and one for the video adapter. This will migrate multiple instances of adapters, some of which will be video adapters and some will be sound adapters.

If an adapter in the source meets the criteria specified for case 0 (in Integration Composer, the first case is always case 0), which in this case is sound adapter, Integration Composer creates an instance in the target based on the expression defined for the sound adapter in case 0.

If an adapter in the source meets the criteria specified for case 1,which in this case is video adapter, Integration Composer creates an instance in the target based on the expression defined for the video adapter in case 1.

If you need multiple cases in the child class but not in the parent class, then create only one case (case 0) for the parent class. All instances created for the child class will be based on the parent class.

However, if you need multiple cases in the child class and in the parent class, the same number of cases must exist in the child and parent classes (for every case of a child class, the corresponding number of cases is required in its parent class).

For example, if you create three cases (0, 1, and 2) for a child class, then create three cases for the parent class.

The maximum number of cases that you can create for a class is 100 (cases 0 to 99).

Expression Builder

You use the Expression Builder feature to create complex or intricate expressions that are lengthy and time consuming to enter. The Expression Builder feature provides a large text editing area and access to a library of predefined functions and operators that facilitate creation of complex transformation expressions.

NOTE You cannot use the Expression Builder feature for a property that is a foreign key (FK), reference property (Ref), or generated value (GV).

When you select a property on the Target pane of the Mapping window and then click **Expression Builder**, Integration Composer displays the Expression Builder dialog box.

The top half of the dialog box is an Expression pane that displays the expression you create. The lower half of the window has two panes—an Operators pane that lets you select operators to use in building the expression and a Categories pane with a tree view that lets you select the building blocks for the expression.

To resize the panes, position the cursor over the bar that separates the panes until the cursor changes to a Horizontal Resize Cursor (); then click the mouse device and drag it to increase or decrease the size of a pane.

The following buttons are available on the Expression Builder dialog box:

Button	Description
OK	Saves the expression or expressions in the Expression Builder dialog box and closes it. However, if errors exist, displays an error message and does not save the expression.
Cancel	Cancels the action and closes the Expression Builder dialog box without saving the expressions in it.
Undo	Cancels the most recent action you performed in the Expression Builder dialog box.

Operators

The Operators pane in the lower left corner of the dialog box provides a selection of operators that you can use to build the expression. A detailed description of the predefined operators in this dialog box is provided in Appendix A, “Expression Functions, Literals, and Operators,” on page 115.

Categories

You can expand the Categories tree in the lower pane to view classes and properties from the data source as well as the predefined functions available in Integration Composer.

Data Source – You can expand Data Source in the Categories tree to display the properties available for the class that you selected in the Source pane on the Mapping window. You can double-click a property to select it for the expression.

NOTE Integration Composer displays only properties for the source class that you selected in the Mapping window when you clicked the Expression Builder icon.

- **Functions –** You can expand Functions in the Categories tree to list the predefined functions that you can use to build the expression. The functions are organized into the following sub-categories: text, SQL, math, mapping execution flow, mapping, logical, and date/time. A detailed description of the predefined functions in this dialog box is provided in Appendix A, “Expression Functions, Literals, and Operators,” on page 115.

When you expand the tree, you can double click an item to select it for the expression, and Integration Composer displays the selected item in the Expression pane of the dialog box.

WARNING When creating expressions using the Expression Builder dialog box, **do not use the tab key**. You can use the space bar to add additional spaces when necessary.

Defining Function Parameters

Expression Builder provides a feature that lets you define a value or range of values for functions. When you select a specific function, a Function Definition icon … appears next to the highlighted function.

When you click this icon, Integration Composer displays the Function Parameters dialog box. This dialog box lets you select additional parameters related to the function. It also contains Help text that describes the selected function.

The Function Parameters dialog box includes the following buttons:

Button	Description
OK	Saves the expression or expressions in the dialog box and closes the Function Parameters dialog box.
Cancel	Cancels the action and closes the Function Parameters dialog box without saving the expressions in it.

You can further define the function by selecting one of the parameters. When you select a parameter, Integration Composer displays a Function Parameters icon for the selected function.

Clicking this button opens a second Expression Builder dialog box that lets you create an expression for the selected parameter.

Syntax Errors

Syntax errors occur if words or symbols are in the wrong order or if you omit them when you create an expression using the Expression Builder. To display syntax errors, click **OK** on the Expression Builder dialog box. Integration Composer displays the reason for the error in the Errors section at the bottom of the dialog box.

When you position the cursor over the error message, Integration Composer displays a ToolTip with information about the error.

Integration Composer does not let you click **OK** and exit without correcting the syntax error. You must correct the error before you can use the expression in the mapping.

Using an Arithmetic Operator

Many expressions are one-to-one relationships from the source to the target. Sometimes, however, the format of the data in the target is different from the format in the source. You can use an arithmetic operator to change the format of the data.

You can use the following arithmetic operators in Integration Composer.

+	addition
–	subtraction
*	multiplication
/	division

For example, suppose that RAM memory is expressed in kilobytes in the source and megabytes in the target. The expression in the target is:

```
‘RAM.Size(bytes)’/1024.
```

When you execute the mapping, this example expression copies the value from the **Size(bytes)** property of the class **RAM** (in the source) to the **Ramsize** property of the class **Computer** (in the target). This value is then divided by 1,024 and placed into each instance created.

Using a Literal

In an expression, a literal is a value that remains unchanged when Integration Composer creates data in the target; literal values are transferred exactly as written. In Integration Composer, you can specify literals for strings and for the following primitive data types: boolean, char, integer, and floating-point. For additional information about using literals, see Appendix A, “Expression Functions, Literals, and Operators,” on page 115.

When every class instance in the target requires the same value, create an expression with a literal. For example, suppose that you are migrating adapter data from a source to a target and you want to use the words **Video Adapter** for the **Mediatype** property in the target. To use this string of words, use double quotation marks to indicate a string literal in the expression, as shown in the following example.

```
“Video Adapter”
```

When you execute the mapping, this expression copies the string literal **Video Adapter** into the **Mediatype** property of the target each time Integration Composer creates an instance of the class of **Media Adapter**.

Deleting Expressions

Integration Composer lets you delete expressions from the Target pane. The way that you created the expression determines how to delete it.

Delete Using the Expression Field

To delete an expression created by the drag and drop method or by typing in a value, complete the following steps:

1. In the Target pane in the Mapping window, select the row that contains the expression you want to delete.
2. Double-click the cell in the Expression column. Integration Composer displays the **Expression** field containing the expression.
3. Highlight the expression and press **Delete**. Integration Composer deletes the expression.
4. Press **Enter**. Integration Composer closes the **Expression** field.

Delete Using Expression Builder

To delete a lengthy expression created with Expression Builder:

1. In the Target pane in the Mapping window, select the row that contains the expression that you want to delete and double-click the row. Integration Composer displays the selected expression in the Expression Builder dialog box.
2. In the Expression pane on the Expression Builder dialog box, highlight the text of the expression and press **Delete**. Integration Composer deletes the expression.
3. Click **OK** to close the Expression Builder dialog box. Integration Composer deletes the expression and displays the Mapping window.

Expression Functions, Literals, and Operators

A

Integration Composer mappings contain expressions that specify how to create data in the target using data from the source. Sometimes expressions are lengthy or intricate, and creating them can be time-consuming. To facilitate the creation of correct and complex expressions, use the Expression Builder feature. Expression Builder contains a library of predefined functions that automate certain tasks.

This appendix describes the predefined functions, literals, and operators commonly used to build expressions in Integration Composer.

Functions

The **Expression Builder** dialog box in Integration Composer provides a set of predefined functions grouped into the following categories: text, SQL, math, mapping execution flow, mapping, logical, and date/time.

All Functions

This feature lists all the Date/Time, Logical, Math, and Text Functions in the Integration Composer library.

Date/Time

The following table describes date/time functions available in the Expression Builder feature.

Function	Description
currentDateString()	Returns the current date as a string.
currentDayString()	Returns the current day of the week as a string.
currentMonthString()	Returns the current month as a string.
currentTimeString()	Returns the current time as a string.
currentYearString()	Returns the current year as a string.

dateString()	Converts a numeric date to a string.
mappingTimestampString()	Returns the mapping execution start time as a string (YYYY-MM-dd-HH.mm.ss.SSSSSS).

Logical

The following table describes logical functions available in the Expression Builder feature.

Function	Description
ifDecimal	Based on the conditional being true or false, returns either the first or second specified decimal value.
ifInt	Based on the conditional being true or false, returns either the first or second specified integer value.
ifString	Based on the conditional being true or false, returns either the first or second specified string value.
logicalAnd	Returns true if both parameters are true.
logicalFalse()	Returns false.
logicalNot	Returns the Boolean opposite of the parameter.
logicalOr	Returns true if either parameter is true.
logicalTrue()	Returns true.

Mapping

The following table describes mapping functions available in the Expression Builder feature.

Function	Description
getMappingStartTimestamp()	Returns the mapping start time stamp as a string.
getSourceDataSchemaName()	Returns the data schema name of the source data source as a string.
getSourceDataSourceName()	Returns the name of the source data source as a string.
getTargetDataSchemaName()	Returns the data schema name of the target data source as a string.
getTargetDataSourceName()	Returns the name of the target data source as a string.
getSourceTableOwner()	Returns the name of the table owner for the source data source as a string
getTargetTableOwner()	Returns the name of the table owner for the target data source as a string

The following table describes mapping execution flow functions available in the Expression Builder feature.

Function	Description
skipCurrentInstance()	During execution, skips the current instance associated with the Deciding Class along with any child or reference instances.
stopExecution()	Stops mapping execution.

Math

The following table describes math functions available in the Expression Builder feature.

Function	Description

decimalToString	Returns a string representation of a decimal value.
	
	`Example`
	`decimalToString(5.3)`
	`returns`
	`a string made of the characters "5", ".", and "3"`

decimalabs	Returns the absolute value of a decimal value **Example** **decimalabs(-15.5)** ***returns*** **15.5**

decimalmax	Returns the greater of two decimal values.
	
	`Example`
	`decimalmax('CURRVALUE','CLOSINGVALUE')`
	`returns`
	`the greater value of properties CURRVALUE and CLOSINGVALUE`

decimalmin	Returns the lesser of two decimal values. **Example** **decimalmin('CURRVALUE','CLOSINGVALUE')** ***returns*** **the lesser value of properties CURRVALUE and CLOSINGVALUE**

intToString	Returns a string representation of an integer value.
	
	`Example`
	`intToString(14)`
	`returns`
	`a string made of the characters "1", and "4"`

Function	Description
intabs	Returns the absolute value of an integer value. **Example** **intabs(-4)** ***returns*** **4**
intmax	Returns the greater of two integer values. **Example** **intmax('NUMHIRED','NUMFIRED')** ***returns*** **the greater value of properties NUMHIRED and NUMFIRED**
intmin	Returns the lesser of two integer values. **Example intmin('NUMHIRED','NUMFIRED')** ***returns*** **the lesser value of properties NUMHIRED and NUMFIRED**

SQL

The following table describes SQL statement functions available in the Expression Builder feature.

NOTE Use of SQL functions might adversely affect mapping execution performance.

Function	Description
executeSourceSQL	logicalFalse() Returns the first column of the first row as a string of an SQL statement's results of source data source. **Example** **Execute an SQL statement on the source database**
executeTargetSQL	Returns the first column of the first row as a string of an SQL statement's results of target data source. **Example** **Execute an SQL statement on the target database**

ATTENTION Integration Composer executes these SQL statements exactly as written. If the database is case sensitive, format the SQL statement to use the correct case.

NOTE If a query returns multiple rows, only the first row will be used in a mapping. If a query returns multiple columns, only the first column will be used in a mapping.

The following table describes text functions available in the Expression Builder feature.

Function	Description
compare	Returns an integer value less than, equal to, or greater than 0 based on the equality of the specified strings.
endsWith(string, suffix)	Returns true if the character sequence represented by the argument is a suffix of the character sequence represented by this string; false otherwise
equals(string1, string2)	Returns true if the two strings contain the same characters in the same sequence; false otherwise. The comparison is case sensitive.
equalsIgnoreCase (string1, string2)	Returns true if the two strings contain the same characters in the same sequence; false otherwise. The comparison is not case sensitive.
indexOf	Returns the index within this string of the first occurrence of the specified substring. **Example** **`indexOf('CONTACT', "FAX")`** ***returns*** **`the first index of the string FAX in the property CONTACT`** If Integration Composer does **not** find the string FAX in the property CONTACT, it returns -1. **Example** **`indexOf("this a string", "FAX")`** ***returns*** **`-1`** **Example** **`indexOf("10.3.2, ".")`** ***returns*** **`2`**
isNull(string)	Returns true if the string is null or if the trimmed string is empty (""); false otherwise.

Function	Description
lastIndexOf	Returns the index within this string of the last occurrence of the specified substring. **Example** **lastindexOf('CONTACT', "FAX")** ***returns*** **the last index of the string FAX in the property CONTACT** If Integration Composer does **not** find the string FAX in the property CONTACT, it returns -1. **Example** **lastindexOf("10.3.2, ".")** ***returns*** **4**
length	Returns the length (number of characters) of a string.
replaceString	Replaces a substring of a string with a new string. **Example** **replaceString("Microsoft® Windows® Operating System", "®", "(R)")** ***returns*** **Microsoft(R) Windows(R) Operating System**
startsWith	Returns true if the character sequence represented by the argument is a prefix of the character sequence represented by this string; false otherwise. **Example startsWith('NODE', "HR")** ***returns*** **true if the property NODE starts with the string HR**
stringToAscii	Removes all non-ASCII characters from a string. **Example** **stringToAscii("Instalaðõo")** ***returns*** **Instalao**
stringToDecimal	Converts a string value to a decimal.
stringToInt	Converts a string value to an integer.
subString	Returns a portion of a string from beginIndex (inclusive) to endIndex (exclusive). **Example** **subString("FIELD 1",0,2)** ***returns*** **the first two characters of FIELD 1**
toLowerCase	Converts all letters in a string to lowercase. **Example** **toLowerCase("FIELD 1")** ***returns*** **field 1**

Function	Description
toUpperCase	Converts all letters in a string to uppercase. **Example toUpperCase("FIELD 1")** ***returns*** **FIELD 1**

trim	Removes leading and trailing white space (tab, space, etc.) from both ends of the string.
	
	`Example`
	`trim("  CELL NAME   ")`
	`returns`
	`CELL NAME`

setToNull(String attributeName)	By default, primitive attribute types (int, long, float, etc.) default to 0 or 0.0 in the target database if a mapping expression is not provided. This is problematic when a 0 value means something in target database. You cannot add a 'return null;' to an expression because a primitive type is expected, and the Java compilation will fail. This function enables you to avoid this problem: For example, you want to set Supportssnmp attribute to null: **{** **setToNull("Supportssnmp"); return 0;** **}** The attribute name is case sensitive. The function can be called in any of the class instance attribute expressions. It must still return the correct primitive type.

Literals

In an expression, a literal is a value that remains unchanged when data is migrated into the target; literal values are transferred exactly as written. In Integration Composer, you can specify literals for strings and for the following primitive data types: boolean, char, integer, and floating-point.

String

To specify a series of alphanumeric characters as a value in the target, use double quotes around a string that consists of more than one alphanumeric character; for example, "MB."

You can use the following literals for escape sequences:

“\n” for New line “\r” for Return “\t” for Tab

Function	Description

“\b” for Backspace “\f” for
Form feed “\’” for Single
quote “\”” for Double quote
“\?” for Question mark “\\”
for Backslash

Boolean

For a boolean data type, you can specify the following literal values:

true
false

Char

To specify a single character as a literal value in the target, use single quotes around a single character (such as ‘Y’) or escape sequence (such as ‘\n’ for new line).

You can use the following literals for escape sequences:

‘\n’ for New line ‘\r’ for
Return ‘\t’ for Tab
‘\b’ for Backspace ‘\f’ for
Form feed ‘\’’ for Single
Quote ‘\”’ for Double Quote
‘\?’ for Question Mark ‘\\’ for
Backslash

In Java programming language, char values represent unicode characters. Unicode is an encoding standard that provides a unique number for every character; this standard is useful because it is independent of platforms, programs, and languages. You can convert unicode to ASCII characters using an escape sequence, as shown in the following example, which produces the copyright symbol.

Example

```
char c = '\u00F6';
Character letter = new Character('\u00F6'); char copyright =
'\u00A9';
```

produces character ©

Integer

You can express integer literals in decimal, octal, or hexadecimal format. For example, the value 64 may be specified in the following ways:

64	Decimal is the default 32-bit
value. 0100	Octal
0X40	Hexadecimal
64L	To specify the 64-bit literal, use the suffix L for long.

Floating-Point

Floating-point literals can be specified as a numeric value expressed in one of the following ways:

Literal	Example
Decimal point	7.512
The letter E or e for scientific notation	6.48e+9
The suffix F or f for a 32-bit float literal	7.89f
The suffix D or d for a 64-bit double literal	456d

NOTE The default for a floating-point literal without an f or d suffix is a 64-bit double literal.

Operators

An operator is a symbol that operates on one or more arguments to produce a result. Various kinds of operators are available on the Expression Builder dialog box.

Arithmetic Operators

The following arithmetic operators are used in Integration Composer.

Operator	Description
+	addition
-	subtraction
*	multiplication
/	division

Except for the + operator, all arithmetic operators require a numeric value. The + operator can be used with a string to specify concatenation, as shown in the following examples:

```
String s1 = "Logon Name: " + 'Computer.Loginname' + " ;"; String s2 =
'ComputerSystem.Manufacturer' + " " + 'ComputerSystem.Model';
String s3 = 'FixedDrives.Driveno' + ":\\";
```

NOTE The final semi-colon in the examples is a statement terminator.

Assignment Operator

The assignment operator assigns one value to another, as shown in the following example:

```
int largestInteger = Integer.MAX_VALUE;
```

Comparison Operators

The following comparison operators are used in Integration Composer.

Operator	Description
<	less than
<=	less than or equal to
>	greater than
>=	greater than or equal to
= =	is equal to
!=	is not equal to

Comparison operators compare two operands in an expression and return a boolean result of true or false. For example, if s=32 and t=64, then the expression s < t would return true, while s==t would return false.

Logical Operators

The following logical operators are used in Integration Composer.

Operator	Description
&&	AND
||	OR
!	NOT

Logical operators let you check for multiple conditions. The && (AND) operator, for example, evaluates two boolean values and returns a boolean value of true only if both values are true. The results of AND and OR logical operators are described in the following table:

Left Operand	Right Operand	&&	||
false	false	false	false
false	true	false	true
true	false	false	true
true	true	true	true

The following example assumes both operands are boolean:

```
‘Node.Isserver’&&’Node.Installed’
```

The logical operator ! (NOT) returns the logical complement of a boolean type; for example, **!true=false**.

Unary Operators

+ - !

The following unary operators are supported by Integration Composer.

Operator	Description
+	returns a positive numeric value
-	returns a negative numeric value
!	returns the logical complement of a boolean type **Example** `!true=false`

Order of Calculations

Occasionally, you must use several operators in a single expression. The abridged list describing the order of operations used by Integration Composer is provided in the following table.

Operator	Description
+ -	Unary positive and negative
!	Unary logical negation
* /	Multiplication and division
+ -	Addition and subtraction
< <= > >=	Inequality

==

!=	Equality and inequality

Operator	Description
&&	Logical AND
||	Logical OR

For example, the sequence of calculations for the following expression performs multiplication first,

    5 + 5 - 2 * 3

to become

    5 + 5 - 6

then addition, to become

    10 - 6

then subtraction, to become

    4

If you want calculations performed in a different sequence, you can use parentheses to control the order of operations, as shown in the following example.

    (5 + 5) * 2 - 3

becomes

    10 * 2 - 3 = 20 - 3 = 17

If an expression contains several operators with the same order preference, then the expression is calculated from left to right.

Initialization Files

B

This chapter describes the initialization files that Integration Composer uses. Initialization files specify various properties of Integration Composer. The following integration Composer initialization files are located in the properties directory in the Integration Composer installation directory:

- fusion.properties
- jdbcinfo.properties
- predb-labels.properties
- assetinit.properties
- deployedasset.properties
- logging.properties
- assetmanager.xml

The properties directory also contains two subdirectories:

- nrs directory

  This directory contains the properties file used for the Naming and Reconciliation Service logging file.

- provider directory

  This directory contains ccmdb.properties, iem.properties and the maximoassets.properties file that is used for IT asset initialization. For more information about using the maximoassets.properties file, see Appendix E – *IT Asset Initialization*.

Integration Composer Properties File (fusion.properties)

The fusion.properties file is stored in the following location:

<installDir>\data\properties

This file is divided into sections. This appendix describes each section of the file. Properties in the fusion.properties file are defined in the following manner:

<property>=<value for the property>

NOTE To include a back slash (\) in a property value, use two back slashes (\\).

IBM Control Desk Database-Related Properties

Property	Value	Comment
mxe.db.schemaowner	dbo	Database schema owner. “dbo” is an example; enter the appropriate schema for your database.
mxe.db.driver	This varies depending on the database, for example: **DB2** com.ibm.db2.jcc.DB2Driver **Oracle: Oracle JDBC Thin driver** oracle.jdbc.driver.OracleDriver **SqlServer: i-net Opta driver** com.inet.tds.TdsDriver	JDBC driver specification
mxe.db.url	This varies depending on the database, for example: **DB2** jdbc:db2://<host_name>:<host_port>/<database_name> **Oracle: Oracle JDBC Thin driver** jdbc:oracle:thin:@<host_name>:<host_port>: <host_sid> **SqlServer 7.0-: i-net Opta driver** (or higher) jdbc:inetdae7:<host_name>:<host_port>?database= <database_name>	JDBC database URL
mxe.db.user		Database login name.
mxe.db.systemdateformat	This varies depending on the database; for example, **DB2** current timestamp **SqlServer** getdate() **Oracle** sysdate	Specifies the database function used to retrieve the current time stamp.

IBM Integration Composer-Related Database Properties

The properties specified in this section apply to all data sources: source, target, and repository.

Property	Default Value	Description
mxe.db.maxRetryConnectionCount	3	Maximum number of attempts to establish or re-establish database connection.
mxe.db.waitTimeSeconds	30	Number of seconds between database reconnection attempts.

Property	Default Value	Description
mxe.db.queryTimeoutSeconds	1200	Specifies the maximum number of seconds that the JDBC driver will wait for a SQL SELECT statement to execute.
mxe.db.updateTimeoutSeconds	1200	Specifies the maximum number of seconds that the JDBC driver will wait for the following SQL statements to execute: ▯ INSERT ▯ DELETE ▯ UPDATE
mxe.db.format.datetime	YYYY-MM-DD HH24:MI:SS	Indicates the format of the value of an Oracle DATETIME data type.
mxe.db.queryDepthLevel	3	This setting is for Change and Configuration Management Database (CCMDB) users. For more information, see the documentation for CCMDB.
mxe.db.queryFetchSize	500	Reserved for future use.
mxe.db.queryCursorOn	false	Reserved for future use.
mxe.db.doBatchUpdate	true	This property determines whether Integration Composer queues SQL statements for the lowest level child class in a data schema tree and processes them in a batch. By default, the value is true, and Integration composer processes the statements in a batch.

IBM Integration Composer Application Properties

Property	Value	Comment
mxe.fusion.help.filename	whskin_homepage.htm	Online help file name, including path. This property is for internal use only. Do not modify this property.
mxe.fusion.browser	For Linux and UNIX operating systems, use: mxe.fusion.browser=netscape	Browser application to use. The default is Microsoft® Internet Explorer®. If you use a Linux or UNIX operating system, Netscape is the Web browser supported. You must specify Netscape for this property.
mxe.fusion.g11n.CalendarType	gregorian	Specifies the type of calendar to use for formatting the dates in Integration Composer time stamps. This property is case sensitive; use lower case. The default value is gregorian. However, other calendars are also supported. For more information about calendar specifications, see the following Web site: http://icu-project.org/apiref/icu4j/com/ibm/icu/util/Calendar.html

IBM Integration Composer Mapping Execution Properties

WARNING The only properties that you should update in this table are:

- mxe.fusion.mapping.errorLimit
- mxe.fusion.diff.disablesoftwareupdate
- perfmon properties
- mxe.fusion.mapping.nrs.enable

Mapping executions will fail if you modify any other properties in this table.

mxe.fusion.diff. disablesoftwareupdate	true	Specifies whether or not you want to update software records. Possible values include the following: • True – Integration Composer inserts and deletes records but does not update them. • False – Integration Composer updates software records. Setting this property to true improves performance. If you set this property to true, Integration Composer ignores any changes to non-key properties after the initial load.
mxe.fusion.mapping. softwareclassname	Software	Name of the software class. This property is used to identify software instances. When a mapping is executed, the setting for the mxe.fusion.diff.disablesoftwareupdate property determines whether instances of software, as defined by this property, are updated or not.
mxe.fusion.referencecac he. Manufacturer	1000,Manufacturervar,PRIMARY_KEY[a]	Internal processing use only.
mxe.fusion.referencecache. Adapter_Variant	1000,Adaptervariant,PRIMARY_KEY[a]	Internal processing use only.
mxe.fusion.referenceca che. Operating_System_ Variant	1000,Osvariant,PRIMARY_KEY[a]	Internal processing use only.
mxe.fusion.referencecache. Processor_Variant	1000,Processorvar,PRIMARY_KEY[a]	Internal processing use only.
mxe.fusion.referencecac he. Software_Variant	100000,Softwarevariant,PRIMARY_KEY[a]	Internal processing use only.
mxe.fusion.referencecache. AssetAttribute	1000,Assetattrid,PRIMARY_KEY	Internal processing use only.
mxe.fusion.referencecac he. OMP	100,Ompguid,ALTERNATE_KEY	Internal processing use only.
mxe.fusion.referencecache sameas.Actual_Target_CI	Actual_Source_CI	Internal processing use only.
mxe.fusion.referencecache. Act ual_Source_CI	1000,Actcinum,ALTERNATE_KEY	Internal processing use only.
mxe.fusion.referencecache.Act ual_Target_CI	1000,Actcinum,ALTERNATE_KEY	Internal processing use only.
mxe.fusion.referencecache.	Sof tware_Product	

1000,Uniqueid,ALTERNATE_KEY Internal processing use only.

mxe.fusion.referencecache.Parent_Product	1000,Uniqueid,ALTERNATE_KEY	Internal processing use only.
mxe.fusion.referencecachesameas.Software_Product	Parent_Product	Internal processing use only.

Property	Value	Comment
perfmon.output	c:\\log\\perfmon.log	This property specifies the for the performance moni performance monitoring l long it takes to process da mapping is executed. You value. You can also specify value if you want to send console only. You must specify an outpu the performance monitori
perfmon.logfrequency	5	This property determines perfmon log is generated. integer that specifies the minutes to wait before ge again. If perfmon.logfrequency= perfmon log will be genera minutes. The new log will existing one if the target is that if a lengthy operation Integration Composer con processing before genera Consequently, the interva generations might someti number of minutes specif If no value is specified or i the log will be generated the mapping.
perfmon.details	false	This property specifies the level of detail in the performance monitoring log. The default value, false, yields a summary report. If you use change the value to true, the log includes all statements processed and details about each statement. The true setting is not recommended if you are processing large amount of data because of the time required to process the data.
mxe.fusion.ccmdb.taddm712	true	This property specifies whether TADDM release 7.1.2 or higher is used. Possible values are: - true — In this case, Integration Composer uses the getObjectSourcesystems API to improve performance. - false — In this case, Integration Composer uses the getManagementSoftwareSystemLinks API.

mxe.fusion.mapping.nrs.enable	true	Enables generation of globally unique identifiers (GUIDs) by Naming and Reconciliation Service (NRS) when a mapping is run.
mxe.fusion.mappin g. showRecordCount s	true	If set to true, mapping record statistics are displayed in the fusion.log file at end of mapping execution, including the number of records inserted, deleted, and updated.
mxe.fusion.itm.url	/servlet/TEMS	Specifies the URL for retrieving data from the IBM Monitoring user interface.

[a]Reference cache values include the following parameters:
<size of initial hashmap>,<variant property name>,<hash by PRIMARY_KEY or ALTERNATE_KEY>

IBM Integration Composer Application Bidi Properties

If you install Integration Composer in Arabic or Hebrew, use the properties in this table to specify properties related to bidirectional language settings.

Property	Value	Comment
mxe.fusion.bidi.BidiSupportO n	false	Use this property to turn on bidirectional support for Hebrew and Arabic text that displays in the user interface and to provide support for complex expressions.
mxe.fusion.bidi.TextDirection	LTR	Use this property to specify the direction of text in the user interface. Possible values include: ▯ LTR — Direction of text is left-to-right ▯ RTL — Direction of text is right-to-left ▯ Contextual — Direction of the text depends on the context. In other words, if the first character with strong directionality in the string is a Bidi character, then the direction will be set to right- to-left. If the first character with strong directionality in the string is not a Bidi character, then the direction will be set to left-to-right.

Login Properties File (predb-labels.properties)

Integration Composer loads the following messages before the database connection has been established.

Property	Value
LogOnTitle	Log in
UserNamePrompt	User ID:
PasswordPrompt	Password:
Error	Error
RestartPrompt	
ApplicationName	IBM Integration Composer
ActionPortletTitle	Actions
RepositoryConnectionFailed	Sign In settings are not valid. See log file for details.\n\n\t\tuser name: {2}\n\t\tpassword: [hidden]\n\t\ttable owner: {3}\n
ErrorPrefix	Error Message:
SQLPrefix	SQL Statement:
InternalError	Internal Error.
FilesListToolTipText	Files List
WelcomeNoteTop	Welcome, please enter your information.
CopyrightNote	Copyright © 2022 By IBM Corporation. All rights reserved. See product license for details.

Connection Properties File (jdbcinfo.properties)

The jdbcinfo.properties file contains Java Database Connectivity (JBDC) and application programming interface (API) settings.

WARNING Do **not** modify the properties in this file.

Logging Properties File (logging.properties)

When Integration Composer executes a mapping, it provides information about mapping executions and data transactions as well as errors in the fusion.log file. The fusion.log file is stored in the following location:

```
<installDir>\log
```

You can also view information about NRS-related events in the fusion.log file. The fusion.log file provides information about actions taken when duplicate deployed assets are found. In addition total NRS counts are logged at the end of the mapping. There is also an NRS-specific log file that provides information about the NRS process. For more information about the NRS log file, see Appendix D, "Naming and Reconciliation Service (NRS)," on page 144.

To configure Integration Composer logs, you use the logging.properties file. The logging.properties file is stored in the following location:

```
<installDir>\data\properties
```

Integration Composer logging is based on Log4j logging, which is an open source project developed by Apache Software Foundation as part of the Apache Jakarta Project. See the following Web site to get more details about Log4j logging services.

http://jakarta.apache.org/log4j/docs/index.html

For more information about the general syntax of property-based configuration files, see the following Web site:

http://logging.apache.org/log4j/1.2/manual.html

The following table lists the error levels Integration Composer supports.

Error	Description
FATAL	The FATAL level logs very severe error messages that indicate application failure.
ERROR	The ERROR level logs error messages that indicate errors in the application functionality that is processed.
WARN	The WARN level logs warning messages that indicate harmful situations in the functionality that is processed.
INFO	The INFO level logs informational messages that highlight the progress of the functionality processed.
DEBUG	The DEBUG level logs extensive messages that are useful to debug.

Log4j Root Loggers

To set up root loggers, specify the comma-separated list of appenders to the root logger. For example, to log messages to standard output as well as to a file called fusion.log, use the following setting:

```
log4j.rootLogger=ERROR, A1, A2
```

Output Destinations or Appenders

A1 is set to be a ConsoleAppender, which outputs to System.out.

```
log4j.appender.A1=org.apache.log4j.ConsoleAppender

log4j.appender.A1.layout=org.apache.log4j.PatternLayout

log4j.appender.A1.layout.ConversionPattern=%d{dd MMM yyyy HH:mm:ss:SSS} [%-2p]
%m%n
```

A2 is set to be a RollingFileAppender, which outputs to the fusion.log file:

```
log4j.appender.A2=org.apache.log4j.RollingFileAppender

log4j.appender.A2.File=fusion.log

log4j.appender.A2.MaxFileSize=5MB

log4j.appender.A2.MaxBackupIndex=5

log4j.appender.A2.Append=false

log4j.appender.A2.layout=org.apache.log4j.PatternLayout

log4j.appender.A2.layout.ConversionPattern=%d{dd MMM yyyy HH:mm:ss:SSS} [%-2p]
%m%n
```

NOTE The value for log4j.appender.A2.File is the name of the file only. Do not include a file path. Integration Composer ignores file paths and saves log files in <installDir>\log.

Loggers Used by Integration Composer

Enable only the loggers that you need and use the logging information only for debugging purposes. Enabling more loggers than you need and setting the log level to DEBUG produces a large number of messages in the appenders and significantly reduces performance of the application.

```
log4j.logger.fusion=INFO

log4j.logger.fusion.datamanager=ERROR

log4j.logger.fusion.diff=ERROR

log4j.logger.fusion.engine=ERROR

log4j.logger.fusion.gui=ERROR

log4j.logger.fusion.om=ERROR

log4j.logger.fusion.nrs.process=INFO

log4j.logger.fusion.provider=ERROR

log4j.logger.fusion.provider.actualci=ERROR

log4j.logger.fusion.provider.altiris=ERROR

log4j.logger.fusion.provider.caamo=ERROR

log4j.logger.fusion.provider.cmdbapi=ERROR

log4j.logger.fusion.provider.discovery=ERROR

log4j.logger.fusion.provider.dblayout=ERROR

log4j.logger.fusion.provider.deployedassets=ERR

OR

log4j.logger.fusion.provider.maximoasset60=ERR

OR log4j.logger.fusion.provider.ee=ERROR

log4j.logger.fusion.provider.fusion=ERROR

log4j.logger.fusion.provider.landesk=ERROR

log4j.logger.fusion.provider.netcensus=ERROR

log4j.logger.fusion.provider.sms=ERROR

log4j.logger.fusion.provider.sms.sms20=ERROR

log4j.logger.fusion.provider.smstangram=ERROR

log4j.logger.fusion.provider.taddmcitype=ERROR

log4j.logger.fusion.provider.taddmdiscovery=ERR

OR

log4j.logger.fusion.provider.taddmactualci=ERRO

R log4j.logger.maximo.sql=ERROR
```

Naming and Reconciliation Service (NRS)

C

Introduction to NRS

Naming and Reconciliation Service (NRS), which is part of Data Integration Services (DIS), is an optional component implemented with Integration Composer that you can use to centralize asset identification and resolve asset duplication. This component helps Integration Composer avoid duplication of deployed asset records in the database. It also provides a way to centralize asset identification across multiple products that share the database.

In previous releases, when importing data into the database, Integration Composer used alternate key values to determine whether a deployed asset record already existed in the database. If the deployed asset existed, its properties were updated. If it did not exist, a new deployed asset record was inserted.

NRS provides centralized control to identify assets. When NRS is implemented, it uses a set of naming rules to assign a globally unique identifier (GUID) to each asset. Each naming rule consists of one or more attributes that are required to identify the asset. For example, there is a naming rule based on manufacturer, model, and serial number.

Naming rules are assigned a priority based on how well the attributes in the rule can uniquely identify the asset. For example, a rule that identifies an asset based on its manufacturer, model, and serial number has a higher priority than a rule that uses the primary mac address to identify an asset.

NRS evaluates these attributes against the naming rules. If the deployed asset data provides the attributes required by a naming rule, a GUID is generated for the deployed asset based on the naming rule. Each naming rule generates a GUID. The more attributes available for the asset, the more likely a higher-level naming rule can be applied in generating the GUID.

An asset can have multiple GUIDs; one is the master NRS GUID and the others are alias GUIDs. The GUID generated for the rule with the highest priority is the master GUID. GUIDs generated by the lower-priority rules are alias GUIDs. The master GUID is displayed in the NRS GUID field in deployed assets applications. Alias GUIDs are maintained by the Naming and Reconciliation Service, but they are not displayed in the user interface.

After an asset has been processed and a GUID is assigned, NRS tracks the GUID- to-asset mapping. Any additional data received about the asset is used to generate alias GUIDs even if the subsequent data can generate a higher priority GUID. However, if attribute data accumulated for two assets indicates that they are actually the same asset, a reconciliation or merging of the GUIDs occurs and a new master NRS GUID is assigned.

In some cases, NRS creates a new NRS GUID that supersedes the existing GUID in the target database. For example, discovery scans might result in additional data about the deployed asset, and NRS might have assigned a new master NRS GUID because of the convergence of the asset with an existing asset. When Integration Composer encounters a conflict between the existing record's GUID and the imported data, it deletes the existing deployed asset record from the target database and adds the new record, including the new NRS GUID.

NOTE In IBM Control Desk, the Computers, Network Printers, and Network Devices applications display both an NRS GUID and a GUID. The NRS GUID is provided by the Integration Composer Naming and Reconciliation Service. The GUID is generated by the data source.

Integration Composer and GUIDs

Integration Composer is instrumental in the creation of the GUIDs. When processing data for a deployed asset, Integration Composer passes as many values as possible to Naming and Reconciliation Service. NRS uses these values to create an NRS GUID for the deployed asset.

NRS creates GUIDS for computers, network printers, and network devices. For NRS purposes, network printers and network devices are processed like computers, but they have an additional property, a function, that identifies them as a network printer or network device. Network printers have the function *printer*, and network devices have the function *router*.

Properties are included in the Integration Composer adapter mappings to facilitate creation of NRS GUIDs and alias GUIDs. Do not modify these properties.

The following table describes the Integration Composer properties that are used to determine NRS GUIDs for computers.

NRS Naming Rules for Computers

Priority	DPA Property Name	Property Description
0	Nrssignature	The primary IP address (static) or, if there is no IP stack, then SNA_HOST
1	Nrsmanufacturer Nrsmodel Nrsserialnumber	Manufacturer Make/Model Serial number
2	Nrssystemboarduuid	System Board UUID formatted (use **getUUIDFormattedString(str)** method)
3	Nrsprimarymacaddress	Primary mac address
4	Nrshostsystem Nrsvmid	GUID of parent of VM (virtual machines only) Unique ID of VM (virtual machines only)
5	Nrsmanagedsystemname	The name to uniquely identify the agent that manages a specific resource.
6	Nrsmanufacturer Nrsmodel Nrsserialnumber Nrsvmid	Manufacturer Make/Model Serial number Unique ID of VM (virtual machines only)

The following table describes the additional properties that are used to determine NRS GUIDs for network printers and network devices.

Additional NRS Naming Rules for Network Printers and Network Devices

Priority	DPA Property Name	Property Description
0	***	This property is not displayed in the schema, but it is required for the naming rule. Integration Composer uses the mapping expressions for the NRS properties that are listed in the previous table to generate a value for this property internally. The value is actually an NRS GUID for the instance as if it was computer. This NRS GUID is considered as the parent property. NRS uses the parent property and th property to generate NRS GUIDs for network printers and network devices.
1	Nrsname	For network printers and network devices, the value in this property is the name of the instance, for example 'myRouter123.'

After GUIDs are created, Integration Composer uses the GUIDs to determine whether a deployed asset already exists in the target database.

When Integration Composer processes data, it compares all the NRS attributes of the record in the database with the NRS properties of the instance that is being processed.

If the deployed asset does not exist, Integration Composer inserts a new record, including the NRS GUID.

If the deployed asset that exists matches the deployed asset that is being processed, but the data for the asset being processed is newer than the existing data, Integration Composer updates the alternate key values in the existing deployed asset data along with the rest of the properties. Deployed assets are considered a match if NRS determines that their NRS properties have the same value for one or more naming rules; for example, the signature value is the same for both deployed assets.

If a match is found and there is an NRS GUID conflict (that is, the same NRS GUID exists for both the existing deployed asset and the one being processed), then the existing deployed asset and the associated child assets are deleted. The newly imported deployed asset is added, including the NRS GUID.

Configuring Integration Composer for NRS

Naming and Reconciliation Service is controlled by the following property in the fusion.properties file:

```
mxe.fusion.mapping.nrs.enable=true
```

By default, the value set for this property is true, and Integration Composer is configured to use NRS. If you do not want NRS GUIDs assigned, open the fusion.properties file and set the value of this property to “false.”

The fusion.properties file is in the following location:

```
<InstallDir>\data\properties
```

To generate an NRS GUID for a property in the target schema, the schema must include the following qualifiers:

- the class must have an 'NRS' qualifier
- the property must have a 'GeneratedNRSGUID' qualifier

By default, the Deployed Asset data schema provides these qualifiers.

Logging NRS-related Events

You can view information about NRS-related events in the fusion.log file, which you can find at the following location:

```
<InstallDir>\log\fusion.log
```

This file provides information about actions taken when duplicate deployed assets are found. In addition total NRS counts are logged at the end of the mapping.

The following logger in the Integration Composer logging.properties file determines the level of information provided for NRS-related events:

```
log4j.logger.fusion.nrs.process=INFO
```

By default, this logger is set to INFO. You can change the setting if you want a higher level of information, such as DEBUG. For more information about loggers, see "Logging Properties File (logging.properties)," on page 135.

NRS Logger

There is an NRS-specific log file, dis%u.consolidate, that provides information about the NRS process. Both log and trace information are recorded in this log file. The log file is saved in the following location:

```
<InstallDir>\log\dis%u.consolidate
```

When the log file is written, the **%u** characters are replaced with a number that identifies the log file.

By default, the logging properties file is set to SEVERE and configured to provide minimal information. If you want additional information, you can edit the logging properties file, which is found at the following location:

```
<InstallDir>data\properties\nrs\dis.logging.properties
```

Additional logging levels include: WARNING, INFO, CONFIG, FINE, FINER, and FINEST.

Bidirectional Language Configuration

D

For users who install Integration Composer in Arabic or Hebrew, Integration Composer provides support for bidirectional (Bidi) languages, including support for the following features:

- National calendars
- Graphical user interface (GUI) mirroring
- Controlling the direction of custom text independent of GUI orientation
- Proper display of complex expressions including Bidi data
- Bidi data normalization to a common Bidi layout

Bidirectional support is invoked and defined in the following ways:

- When you install Integration Composer, if you select to install in Arabic or Hebrew, the user interface is mirrored.

- After you install Integration Composer, you can define parameters in the fusion.properties file that specify the national calendar, the direction of custom text, and how to display complex expressions.

- When connecting to a data source or defining a data schema, you can define how to transform data in the data source to the bidirectional formats required for Integration Composer.

ATTENTION Bidirectional language support is not available for Sun Solaris platforms.

National Calendars

Users can specify the type of calendar to use for formatting the dates in Integration Composer time stamps. National calendar support is defined in the IBM Integration Composer Application Properties section of the fusion. properties file. The following property controls the type of national calendar:

```
mxe.fusion.g11n.CalendarType
```

The default value is Gregorian. However, other calendars are also supported. For more information about calendar specifications, see the following Web site:

http://icu-project.org/apiref/icu4j/com/ibm/icu/util/Calendar.html

These values are case sensitive. Use lower case.

The calendar that is specified in the fusion.properties file applies to the entire installation. Calendars are not specific to each user.

Do not confuse calendar type (that is Gregorian, Hebrew, Islamic,

etc.) with calendar translation. Translation of calendars (that is,

days of the week, names of the month, numbering format, etc.) is

controlled by the locale setting at the operating system level.

GUI Mirroring

Because the natural reading order for Hebrew and Arabic is right to left, when users install Integration Composer in Arabic or Hebrew, the user interface is mirrored; that is, it is flipped around an imaginary vertical axis passing through the middle of the screen. The user interface components flow from right to left.

Mirroring is provided automatically based on the language selected when you install Integration Composer. The user interface is mirrored if you install either Arabic or Hebrew.

Defining Bidirectional Settings in fusion.properties

In the IBM Integration Composer Application Bidi Properties section of the fusion.properties file, there is bidirectional support for the following features:

- Controlling text direction independent of the user interface direction

  Set this property if you install Integration Composer in one directional format but want to work with text that has a natural direction that is different from the direction imposed on the user interface at installation.

  For example, if you install Integration Composer in a language, such as English, that is not transformed to a bidirectional language (and thus not mirrored), you might want to work with data from a bidirectional language, such as Arabic.

  To control text direction, you must turn on bidirectional support using the **mxe.fusion.bidi.BidiSupportOn** property and use the **mxe.fusion.bidi.TextDirection** property to specify the direction in which to display text.

  In this way you can view Arabic data displayed in a right-to-left direction even though the user interface is displayed in a left-to-right orientation.

  This property determines the direction of text that you enter into Integration Composer and the text that Integration Composer displays in the user interface.

  For plain Bidi text, the Unicode Bidirectional Algorithm (UBA) generally specifies satisfactorily how to reorder bidirectional text for display. This algorithm, or close to it, is implemented in the presentation systems of a number of platforms, giving them a good handle on bidirectional support.

However, all bidirectional text is not necessarily plain text. There are also instances of text structured to follow a given syntax, which should be reflected in the display order. The general algorithm, which does not take into account these special cases, often gives incorrect results when displaying such structured text.

Bidi support provided in IBM Control Desk based products provides for proper display of bidirectional text as part of structured text.

Currently Integration Composer provides support for the following types of complex expressions:

- Java like code
- Delimited patterns

To invoke support for complex expressions, you must turn on Bidi support using the **mxe.fusion.bidi.BidiSupportOn** property.

The default path for the fusion.properties file is

```
C:\Integration  Composer\data\properties\fusion.properties
```

Your installation directory depends on the option selected at installation and might be different.

Controlling Text Direction

To specify that text is displayed independent of the user interface, complete the following steps:

1. If Integration Composer is open, exit the application.
2. Navigate to the following location in your Integration Composer installation directory and open the fusion.properties file in a text editor, such as Notepad.

   ```
   <InstallDir>\data\properties
   ```

3. To turn on bidirectional support, in the IBM Integration Composer Application Bidi Properties section, set the **mxe.fusion.bidi.BidiSupportOn** property to true, as shown in the following example:

   ```
   mxe.fusion.bidi.BidiSupportOn=true
   ```

4. To specify the text direction, set the **mxe.fusion.bidi.TextDirection** property using one of the following options:

Text Direction Properties

Property	Description
mxe.fusion.bidi.TextDirection=LTR	Direction of text is left-to-right
mxe.fusion.bidi.TextDirection=RTL	Direction of text is right-to-left
mxe.fusion.bidi.TextDirection=Contextual	Direction of the text depends on the context. In other words, if the first character with strong directionality in the string is a Bidi character, then the direction will be set to right-to-left. If the first character with strong directionality in the string is not a Bidi character, then the direction will be set to left-to-right.

5. Save the changes to the fusion.properties file.
6. Restart the Integration Composer application to implement the change.

Invoking Support for Complex Expressions

To invoke support for complex expressions, complete the following steps:

1. If Integration Composer is open, exit the application.
2. Navigate to the following location in your Integration Composer installation directory and open the fusion.properties file in a text editor, such as Notepad.

   <InstallDir>\data\properties
3. To turn on bidirectional support, in the IBM Integration Composer Application Bidi Properties section, set the **mxe.fusion.bidi.BidiSupportOn** property to true, as shown in the following example:

   mxe.fusion.bidi.BidiSupportOn=true
4. Save the changes to the fusion.properties file.
5. Restart the Integration Composer application to implement the change.

Defining Bidirectional Data Normalization

On various platforms and in relational databases (RDBMS), data can be stored in different bidirectional layouts. When data is transferred from one system to another or is used in data comparison, it must first be transformed to one common layout. Otherwise the logic based on data manipulation might provide incorrect results.

When moving data from one database or platform to another, transformations are performed using the following five attributes:

- Ordering Scheme

  Ordering scheme determines the order in which the text is stored.

- Text Orientation (also known as Base Text Direction)

  Text orientation specifies the direction governing most of the text. After segmenting the text into directional runs, runs are laid out for presentation using the text orientation specified for the data.

  The text orientation attribute should also set a default for alignment.

- Symmetric Swapping

  For characters that have an implied directional meaning, such as less-than and greater-than signs, or various forms of parentheses, symmetric swapping specifies whether such a character should be displayed with the glyph of its symmetrical equivalent when this character appears in a right-to-left directional run.

- Text Shaping

  Text shaping is specific to the Arabic language. Because Arabic is a scripted language, shape of an individual character is sometimes determined by the character that precedes or follows it. This attribute specifies whether each Arabic letter is stored using an intrinsic code point representing all possible shapes of this letter (leaving determination of the proper shape for later) or using a specific code point representing the shape that should be used for presentation of this letter at this place in the text.

- Numerals (also known as Numeric Shaping)

  This attribute specifies which form of digits to use when presenting regular digits (encoded as 0x30 to 0x39 in ASCII).

A combination of specific values for the preceding five attributes constitutes a bidirectional layout.

Each time data is retrieved from an external RDBMS that uses a layout different from the Integration Composer Bidi layout, it must be transformed to the Integration Composer Bidi layout before the user can work with it in Integration Composer.

Consequently, when you define a new data source or define a new data schema, you must define the attributes for transforming the data in the data source to the formats needed in Integration Composer.

The following table describes the default values specified for the bidirectional attributes and the options available for Integration Composer.

Bidirectional Layout Formats for Integration Composer

Attribute	Default	Possible Values
Ordering Scheme	Implicit	**Implicit –** (also known as Logical) The text is stored in the same order as it is spoken and, usually, entered. **Visual –** The text is stored ready for presentation.
Text Orientation	LTR	(This feature is also known as Base Direction.) **Left-to-Right –** The directional runs are laid out from left to right. This is appropriate for text that is mostly written with left-to-right scripts but might contain words or phrases written in right-to-left scripts. The default alignment should be set to left. **Right-to-Left –** The directional runs are laid out from right to left. This is appropriate for text that is mostly written with right-to-left scripts but might contain numbers, words or phrases written in left-to-right scripts. The default alignment should be set to right. **Contextual Left-to-Right –** The required direction of the text is determined based on the text itself. If the first strong character belongs to a left-to-right script, the direction resolves to Left-to-Right. If the first strong character belongs to a right-to-left script, the direction resolves to Right-to-Left. If there is no strong character in the text, the direction resolves to Left-to-Right. **Contextual Right-to-Left –** The required direction of the text is determined based on the text itself as described for the preceding Contextual Left-to-Right value. However, in this case, if there is no strong character in the text, the direction resolves to Right-to-Left.
Symmetric Swapping	Yes	**Yes –** Replace characters with their symmetric equivalent in right-to-left runs. **No –** Do not replace characters with their symmetric equivalent in right-to-left runs.
Text Shaping	Nominal	**Nominal –** Arabic letters are encoded with intrinsic code points (in the "06xx" range for Unicode). **Shaped –** Arabic letters are encoded as presentation forms which can be Initial, Middle, Final or Isolated. **Initial Shaping –** Arabic letters encoded with intrinsic code points must be transformed to Initial shapes for presentation. **Middle Shaping –** Arabic letters encoded with intrinsic code points must be transformed to Middle shapes for presentation. **Final Shaping –** Arabic letters encoded with intrinsic code points must be transformed to Final shapes for presentation. **Isolated Shaping –** Arabic letters encoded with intrinsic code points must be transformed to Isolated shapes for presentation.
Numerals	Nominal	(This feature is also known as Numeric Shaping.) **Nominal –** Display digits as Arabic-European digits. **National –** Display regular digits as Arabic-Indic digits (National format). **Contextual –** Display regular digits as Arabic-Indic digits if following Arabic letters. Otherwise, display as Arabic-European digits.

Defining Bidirectional Layout Settings

You define bidirectional layout settings when defining a new data source or when defining a new data schema in the Integration Composer user interface.

To specify bidirectional settings, complete the following steps:

1. From the Connection Information panel on the Define New Data Source or Define a New Data Schema window, after you define the connection parameters for the data source, click **Bidi Layout Format**.
2. In the Bidi Settings window, specify values in the following fields:
   - Ordering Scheme
   - Text Orientation
   - Symmetric Swapping
   - Text Shaping
   - Numerals
3. Click **OK** to save the settings and close the Bidi Settings window.
4. On the Connection Information panel, click **Finish**.

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